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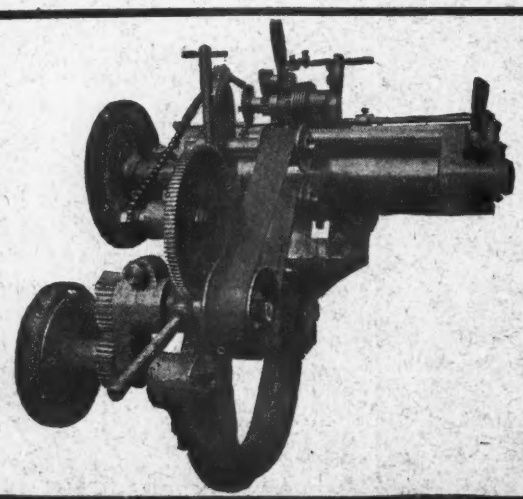

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ELECTRICAL REVIEW.

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NATIONAL INDUSTRIAL ORGANISATION.

FROM the observations which appeared in our issue of January 21st, under the title "National Business Organisation," it will have been gathered that we viewed with regret the division of the different forces which were engaged in endeavouring to form a powerful national industrial organisation. There were several separate movements on foot, each of them was fairly strongly backed by important industrial interests, all of them were making headway in their own circle or sphere, and the objects in view were, in the main, very similar. Was it desirable, when there was a practically universal recognition that a truly national organisation of impressive proportions and effective strength was one of the greatest industrial needs of the times, that these groups should continue their efforts independently? If want of co-operation among industrial interests had been a weakness in the past, why perpetuate the error by a division of the very forces which were aiming to remedy it? The air has been thick with new schemes and proposals of one kind and another all the while we have been at war, and their existence, the interest that they have evoked, and the support that they have received, have proved beyond doubt the desire of industry to concentrate its forces.

Probably all of these schemes have contributed some assistance in stimulating interest in the idea of associated and co-ordinated policy, but three of them stand out more prominently than the rest as demanding serious attention when the time is ripe for seeing whether an amalgamation of forces can be effected. The Institute of Industry is one; the second is a substantial organisation started in the Midlands by Mr. Dudley Docker; and the third is the Manchester scheme set on foot by Sir Charles Macara. With the first we have dealt pretty fully on several occasions; its little plaster exhibition building overlooking the Strand still stands as a monument to its earlier memory, though fast crumbling to decay, like some of its earlier ambitions. Our readers will have noted that we never have been able to treat this movement as being seriously representative of the great industries of the country; it has not been founded or engineered in a manner which called forth either our respect or our admiration. When, therefore, we were invited to take tea with the Court of Directors last week, on the occasion of the making of an "important announcement," the object of the gathering being "The creation of a national organisation *adequately representing British industrial interests*," we attended with some curiosity, little enthusiasm, and only just a slight modicum of hope. As the proceedings developed, however, our curiosity developed into a deep interest, and our enthusiasm and our hope both rose very high. We are in doubt as to which was *the* "important announcement," for there were several. One was to the effect that the Institute of Industry was willing to sacrifice its name; the other that any director would retire in order to strengthen the Association; and last, but not least, Mr. J. Taylor Peddie had placed his resignation in the hands of the directors, so that they might offer to those who wished to join forces with them the advantages of a central association free and unfettered by any existing agreement as to management. So be it! Mr. Nettlefold, in his control of the proceedings, impressed us with his unquestionable sincerity. He gave us clearly to understand that the Institute of Industry, as we have known it, is willing to sacrifice itself in order that there may be that consolidation of national resources which is a vital necessity.

The way was thus opened for valuable discussion, and as representatives of the two important groups which have made no inconsiderable headway (Mr. Dudley Docker stated that his movement was supported by from 30 to 40 firms who were each willing to put down £1,000 apiece) were present, it was possible for practical suggestions to be advanced. Mr. Docker proposed that a conference should be held between the Institute of Industry, the Association with which he was concerned, and the Manchester group, and he expressed the opinion that from such a conference there might emerge a big association, which even the British Government would have to recognise. He suggested that they should all "come under one umbrella" (we think he meant a new one) in order to co-operate efficiently. We are pleased to state that the proposition was accepted by the chairman on behalf of the Institute; it was approved by Mr. F. R. Davenport, who, as a director of the Manchester movement, said he would recommend it to the Manchester group; and it was supported by Mr. A. W. Tait, who is not disinterested in electrical and financial affairs. We believe that the conference actually took place within a few hours after the suggestion was made, and we shall hope to hear in due course that an entirely new and central organisation will be speedily established, forming an "umbrella" which shall shelter all our national industries from the cold water of the politicians whom Mr. Dudley Docker and not a few others abominate.

Two of the principal essentials for such an organisation are, as Mr. Tait remarked, brains and money—both are required in the best quality and the largest quantity. We asked a couple of months ago whether it was suggested that industrial firms should pay their usual trade association subscriptions and find funds for the new institute or association as well. Mr. Docker's efforts have proved that, when once it is realised that a truly great organisation is in prospect, funds will flow in freely. Hundreds of associations which are in existence will doubtless desire to link up to such a body, because they will expect it to exert in combination such a powerful influence in matters of prime concern as individually or in smaller groups they could never hope to exert. Hundreds of wealthy industrial companies and firms would also be prepared substantially to support movements which are going to assist them in the expansion of their operations.

The matter of finance in such an organisation is an interesting one. Mr. Allcock, of Manchester, advanced a suggestion which is deserving of careful consideration. He urged that in their thought of, and regard for, great ideals, they should not overlook the fact that there were many sectional associations which were doing very useful work. The money for a new association might be obtained by linking these all up together. At present most of them intermix idealistic and practical efforts. A transfer of the idealistic duties from each of the national organisations might induce those sectional associations to contribute a percentage of their income (say 10 per cent.) to the national body, which, by its constitution and objects, would cover all those matters concerned with what may be termed national policy in relation to industry. The remainder of their incomes they would continue to expend upon the aforesaid useful practical work. He mentioned, to illustrate his suggestion, the willingness with which a firm of, say, engine-makers, would subscribe to the funds of their own association if they were convinced that a better market for their engines would be secured; but they would be averse to subscribing to funds which had ideals as their aim. This is, perhaps, a point of detail which may well be left to the judgment of the court of directors of the new association or federation, or whatever it may be called, but we repeat that it is well worthy of consideration if for no other reason than that it would permit existing associations to leave undone some things that at present absorb a good deal of their attention, and allow them to increase their own usefulness to the trades that they represent by concentrating on work of really practical value.

The Institute of Industry, it will be remembered, dropped "science" from its title. It may be that the new Federation of British Industries will find that it can consolidate its forces in the most profitable manner by going a step further. It may recognise that it will be unnecessary for it in any way to overlap the operations that are likely to ensue from the national organisation of science which is being proceeded with by the Royal Society. A great and effective scientific organisation of this character can render service to science, and those who affect it as a calling, by linking up all the scientific societies and institutions for combined effort in the national interests. And if beside this there were a great Federation of British Industries, there would be available two essential parts of one grand organisation which would strengthen our prestige and position throughout the world. This is surely an object for which all should labour, and if for its fruition the spirit of self-sacrifice has to be exercised—as we believe it must be—we are sure that no founder, and no Institute, will be permitted to remain as an obstruction in the path. It is useless shutting our eyes to the fact that certain of those who have a substantial stake in some of the present movements will require such a sacrifice. The chairman most gracefully and appropriately signified by his announcements that such an eventuality had been foreseen, and we believe that he and his court of directors will, as a result of conference and mature deliberation, come to the conclusion that it must be made.

The I.E.E. and its Council.

The Council's nominations for the vacancies which will occur in the offices of president, vice-presidents, honorary treasurer, and ordinary members of Council, on September 30th next, are now in the hands of members. The task of commenting upon this document is one of considerable difficulty, since it is regrettably easy to be suspected of invidiousness when any names are mentioned. We may, therefore, begin by saying whatever we can that is favourable, just to show that we are not content with expressing dissatisfaction only.

The addition of Mr. Chattock to the body of vice-presidents will, we think, be welcomed by everyone, especially in the great industrial district of which Birmingham is the centre, and in which the heads of lesser concerns affectionately allude to him as "The Chief."

With respect to the ordinary members of Council, we must observe that it does not appear to be at all representative of the large manufacturing concerns of the country. How are we to look for that co-operation and that co-ordination of interests which are so much talked of unless representatives of all these interests are included?

The central-station engineers were at one time conspicuous by their absence from the Council, but we saw the somewhat violent advent of Mr. H. F. Proctor, and now we see upon it Mr. Chamen, Mr. Chattock, Mr. Christie, Mr. Dickinson, Mr. Highfield, and Mr. Woodhouse, to mention only those who are now members.

Certain sides of the manufacturing industry are fairly well represented, and we welcome the nomination of Mr. Nisbett, who will not only tend to preserve the continuity of the Council with its predecessors, but whose firm is embarking upon more than cable-making, and so becoming somewhat more representative of manufacturing in general.

It is, however, with regard to the presidency that we must sound a note of warning.

Dr. Ferranti was made president, amid universal acclamation, for a second successive year, he being the first president to be honoured in this way. We all had hopes at that time of the carrying into practice of a certain "broader policy," and that we might go forward under gallant leadership to a conquest of industry by electricity and to a conquest of electricity by the British race. That these hopes proved largely illusory was hardly the fault of Dr. Ferranti.

Mr. Duddell's eminent services to electrical science had their natural result in a second year for

him. We refrained from expressing any views on the question at the time of his re-election, for, as will be remembered, there was something of a set made against him, with which we did not desire to be identified. Sir John Snell did not occupy the chair for a second year, and we then hoped we had broken away from the new practice before it had become a custom.

We are sure that we shall not be accused of any feeling adverse to Mr. Sparks, when we say that we unfeignedly regret that it is proposed to elect him to the chair for a second year. We welcomed his accession to that dignity; we have admired his occupancy of the chair; his popularity is as unquestionable as it is well-deserved. We feel, however, that there are so many excellent men on the Council, whose arrival at the head of the profession is delayed by the course proposed, that it is our duty to protest against it.

We sincerely trust the practice will not become customary with the Institution. The gain, if any, to be obtained by the holding of the presidency for two successive years by any member, however distinguished, is not obvious, and it makes the pace too slow for those behind.

Cross-talk.

That technical phrases which are perfectly intelligible to technical men should nevertheless present perplexing problems to lawyers is not a matter for surprise, least of all when they relate to such abstruse phenomena as electrostatic and electromagnetic induction, which have no parallel in the experience of the layman; but it is a matter of considerable importance when it affects the construction of a specification or the performance of an installation, and this was well exemplified in a case which was heard recently at the Salford Hundred Court of Record. In this case the plaintiffs, Messrs. Pearson's (Electricians), Ltd., a Manchester firm of electrical contractors, sued for a balance of account due for an intercommunication telephone installation which was guaranteed against "cross-talk." The defendants claimed that the installation did not comply with the specification, inasmuch as conversations could be overheard by departments which had not been called; the instruments and cable were of the double-line type, and were properly installed, so that inductive effects were eliminated, but the defendants claimed that a secret service was required and promised, and thus the case depended entirely upon the definition of "cross-talk."

The managing director of the plaintiff company, a representative of the General Electric Co., Ltd., and Mr. L. E. Wilson, A.M.I.E.E., were called on behalf of the plaintiffs, and in response to a request of the judge for a clear definition, "cross-talk" was defined as "electric energy conveyed through space and not by contact or connection." A representative of Messrs. Siemens Bros. & Co., Ltd., who was called for the defendants, agreed with this definition, and therefore judgment followed for the plaintiffs.

Those who were concerned with the installation of intercommunication telephones in the last decade, when single-line circuits were in general use, will remember that as the number of stations increased the trouble from cross-talk became acute on any busy system, and in 1909 Mr. L. E. Wilson, in a short paper on "Telephones" which he read before the Manchester Local Section of the I.E.E., pointed out that while cheapness was thus attained, the consequence was the production of cross-talk, which depreciated the value of the system generally; he went on to point out that cross-talk was directly proportional to the potential of the line. Mr. K. B. Miller also, in his "American Telephone Practice," stated that when one circuit acted inductively on another so that conversations on one could be heard on the other, the phenomenon was termed "cross-talk," and was attributed chiefly to electromagnetic induction. Counsel for defendants endeavoured to show that the badinage of two comedians talking at one another was known as "cross-talk," with what relevance we are unable to imagine.

The moral to be drawn from this case is that manufacturers in their catalogues, and contractors in their tenders, should make it clearly understood that immunity from cross-talk does not mean that a line when in use cannot be tapped by a third party, or that a secret service is to be provided; such secret service can, of course, be given, at a price, but is not contemplated in the ordinary intercommunication installations. Even when the double-line system is installed, cross-talk may still be present if the combination is not properly connected up. Expert opinion is adverse to the use of single lines beyond ten stations, though unfortunately contractors are to be found who would not hesitate to go to thirty lines.

Electrical Trade in Australia.

In view of the new situation that is arising in the Australian Commonwealth in consequence of the very thorough policy adopted by the Government for limiting the activities of German and Austrian traders there both during and after the war, we took advantage of the opportunity presented by the presence in this country of Mr. G. T. Milne, H.M. Trade Commissioner for Australia, to interview that gentleman on the present position and the outlook electrically. It is, of course, of the first importance that British firms who are anxious to open up new business connections in that part of the world should closely analyse the statistics of Australian import trade, so that they may see what proportion of the trade in their particular lines is already in British hands. In some sections of the industry we have a substantial hold on the trade that is going, but the conditions are likely to be so much more favourable to our manufacturers in all lines henceforth that the proportion that has gone to enemy traders in the past will be ours if we are able to tackle the business in the right way; in addition, there will also always be new development work in progress. These two possibilities should afford considerable scope for British activity without rendering competition between British firms unduly keen. From our conversation with Mr. Milne respecting the outlook, we judge that he holds the conviction that Australia is a very fine field for the sale of electrical machinery, fittings, and appliances. The uses of electricity are rapidly extending there as everywhere else, and they will continue to do so, but so far as the British manufacturer is concerned, Mr. Milne emphasises the point that when dealing with public bodies in particular, it is impossible to do business without proper local representation. A new firm entering the field cannot expect to do business unless it has a live representative on the spot, and the best course to adopt before appointing such is to send out a responsible representative who knows the electrical trade thoroughly, especially on its commercial side, to make a survey of the whole field and see whether that field justifies the opening of a branch or merely the appointment of agents. Perhaps a number of our firms will undertake such surveys on co-operative lines?

American and Japanese competition is a factor to be reckoned with. During the war there has been a development of Japanese manufacturing activity —Japanese electric lamps, switches, insulators, glass, etc., and even complete installations, are on offer. Whereas Germany formerly took large orders for insulators on account of price, there is now local manufacturing in this department as well as Japanese tendering. Japanese travellers have been on the ground recently, and their activities are not likely

to be reduced at present. The policy of the Commonwealth Government is, of course, to support local manufacturers first of all, British manufacturers next, and our Allies will naturally follow closely thereafter in respect of any preferential treatment. Nobody can tell at present what is to be the upshot of trade affairs in the Australian market, save that the German trader is not likely easily to get a look in. It may be predicted with reasonable confidence, however, that the spirited and thorough policy that has been applied in respect of the metal industries will bring local industrial changes, and one of these will involve the drawing of copper wire in Australia. Representatives going out from England are advised to study on the spot this question of local industries in its bearing upon their own contemplated schemes for opening out branches. Viewing our trade with the Commonwealth as a whole, we are assured that where matters have gone against us in the past it has frequently been due not to high prices, but to failure to give delivery up to time.

Lead.

There has not been much change in the general position of pig lead lately, although the price rose considerably further up to about £36 10s., a new high record, notwithstanding the recent Government prohibition of speculative dealings. Under the new regulation, pig lead is, of course, no longer a free market, so that the present state of comparative scarcity is having, if anything, the more effect upon the trend of prices whenever the demand assumes some importance. The view, at any rate, is generally expressed by dealers that the authorities would have been wiser by not interfering with the market. Offers of distant metal are now generally held back and consumers find more difficulty to "hedge in" against their forward requirements. Transactions are chiefly confined to prompt and near shipments, which tends to narrow down the range of values. The price of foreign lead now stands near £34 15s. usual London terms ex ship Thames, which is not much less than 100 per cent. above the normal figure in peace times, but so far as can be gathered, there is not room for a big fall in the price until the quantities diverted to this country are more commensurate with the size of the abnormally heavy current requirements, chiefly in connection with munition work. There is no indication of an improvement in the latter direction, for the present at any rate, while the situation is aggravated by a multitude of adverse circumstances. The chief of these is undoubtedly the pronounced spell of stringency which has been developing across the Atlantic, where values have been raised to a level equal to something like £40 a ton, which virtually precludes the possibility of contracts being arranged for shipment to this side.

There is now apparently a ready demand in America for all the metal which is being turned out in order to provide for the much larger domestic needs, while outstanding contracts have yet to be met for export, partly to Japan. The American position is now affected by the utterly paralized state of the mining industry of Mexico. Operations at the American Smelting and Refining Company's plants in Mexico have been entirely stopped, and there is no prospect of early resumption of working there.

As regards the European situation, indications do not hold out much hope of relief. Mining operations in Spain still leave much to be desired after the recent labour troubles, producers being severely handicapped by fuel scarcity and abnormally high costs. A large portion of the Spanish production has been for some time past finding its way direct to France, so that the quantities coming to this side continue small. A fair average tonnage is coming forth from Australia, but the arrivals continue considerably short of last year, and it is to be feared that market conditions will continue pretty tight over the next few months.

SHERRY'S SAWMILL AND TIMBER WORKS.

The saw mills and timber conversion and treating works, which are illustrated herewith, have been constructed and equipped for Mr. Sherry, at Homerton Bridge, Homerton, from the designs and under the superintendence of Mr. W. Worby Beaumont, M.Inst.C.E., M.I.E.E.

Mr. Sherry has another saw mill at Old Ford, and some time ago he contemplated remodelling that mill as to its power plant and as to its timber seasoning department; but on this he was advised, and finally decided to erect entirely new works at Homerton.

The Old Ford works were supplied with power from suction gas plant and some electric motors, and, on advice, it was intended to install a modern steam plant in the place of the suction gas engine. The engine, however, which was designed to comply with the circumstances of the old works, has instead been erected in the new works at Homerton.

These new works are of particular interest because of the remarkable economy which has been effected in the cost of power. They are situated on the Lea Navigation, on land which had been waste until recent times; the site has been leased from the London County Council, which authority has a large area thereabouts still unused.

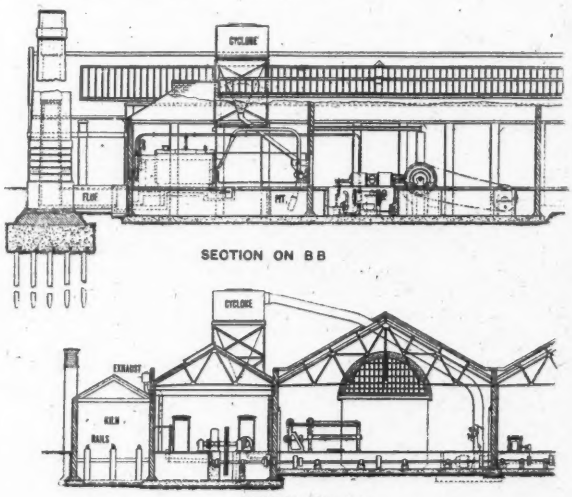


Fig. 1.—Longitudinal and Transverse Sections of the Sawmills (see fig. 2).

Mr. Sherry imports timber of various kinds on a large scale, and prepares it for the various prepared-timber users, especially the furniture and joinery trades. The preparation of the various woods, chiefly in the form of surfaced boards, light scantling stuff, and mouldings, produces a large quantity of sawdust and shavings, especially the short shavings from surfacing and moulding machines. About 26 tons of this sawdust and fine shavings was produced per week; a considerable quantity was formerly used for horse bedding, for which it was sold at a nominal price, but most of it is now used for power production by combustion in high-pressure superheated-steam generators, supplying steam to a compound condensing engine.

The general plan of the works is shown by fig. 2, whilst fig. 1 gives longitudinal and transverse sections of the mills. The sub-soil of the land on which the mills are built is a very varied composition of mud, silt, bog, gravel, clay, and shifting sand, and special precautions had to be observed in preparation for making foundations, especially in the case of the chimney.

All the foundations for the mill building and engine room are of wide-base concrete, heavily reinforced with strong expanded metal. Piling and heavy timber work had to be resorted to for the chimney

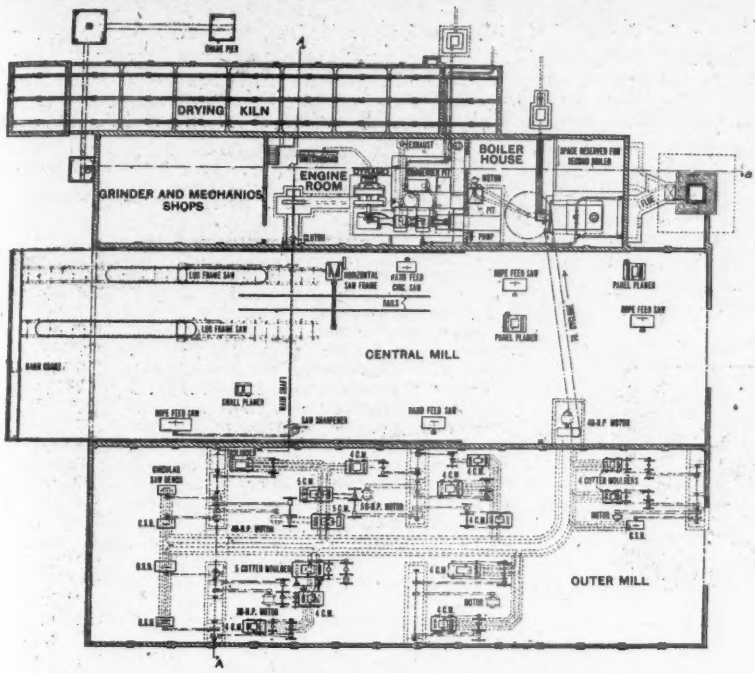


Fig. 2.—General Plan of Sherry's Sawmills.

foundation, which cut through into water-logged substrata below the level bed of the adjacent Lea navigation.

Adopting the experience and practice gained at other works by the same designer, the mill machinery is in part driven by direct rope drive to main shafting, and partly by electric motors to separate machines, or groups of machines, supplied with current from a continuous-current generator on the engine shaft.

The general plan, fig. 2, shows the two large mills, engine and boiler house, the gluing-up shop, and, alongside of the engine house, the drying kiln, which is about 30 ft. from the Lea Navigation Canal. A long jib crane commands the barges in the canal and the east end of the drying kiln, and the timber yard east of it. In the central mill there are several log frame saws, two of which are shown in position, and a number of other machines. In this same mill is the large exhausting fan, by which all the sawdust and surfacing-machine shavings are collected from the outer mill and delivered by a trunk 2½ ft. in diameter, as shown, into a large separator erected above the boiler house, from which they pass into a refuse pit therein. The positions of the present boiler and space for a second boiler (which is about to be installed), feed pumps, steam pipes, etc., are shown in the same plan, and in the adjoining engine room are seen the engine, dynamo, rope drive to main shaft in the central mill, switchboard, etc. The relative positions of these parts of the plant are further shown in the two sectional elevations taken on lines A A and B B of the plan.

The engine is of the tandem compound Paxman-Lenz type, with cylinders of 12 in. diameter and 21 in. stroke; the air pump is worked from the tail rod of the low-pressure cylinder. The engine works with steam at a pressure of 160 lb., superheated 200 deg. F., and runs at 200 R.P.M. The surface condenser arranged in the basement as shown is of large capacity, having in view the introduction of further steam and electric power. By arrangement with the Lea Conservancy, circulating water is taken from the Lea Canal and returned thereinto, and blow-off water from the boiler also finds its way into the canal from an interception pit.

Though not shown in the drawings, there is a large oil separator, as well as a steam separator and oil pumps, in the condenser pit. The boiler is of the Economic type, 14 ft. in length and 8 ft. 7 in. in diameter, with two furnaces specially arranged for firing with continuous air and refuse fuel supply from the cyclone separator, as before mentioned. The sawdust

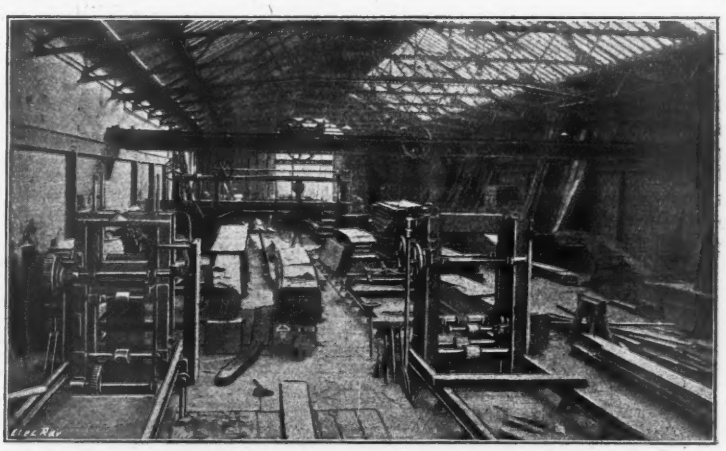


Fig. 3.—Central Mill, showing Log Frame Saws.

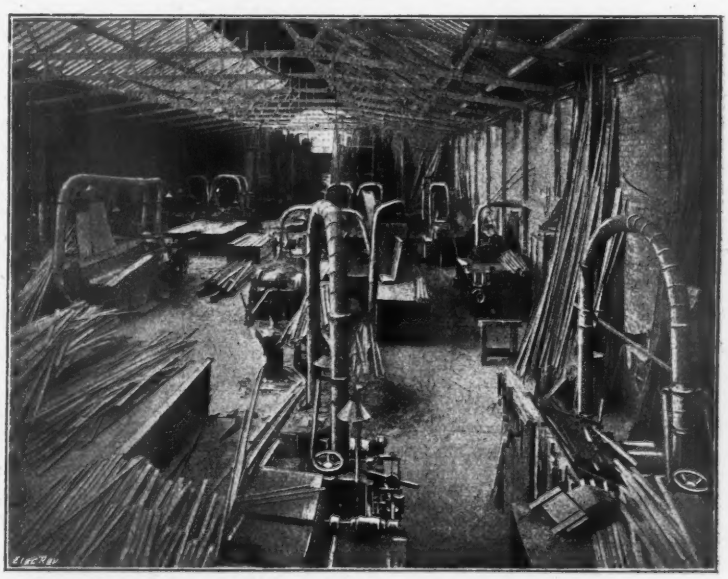


Fig. 4.—Outer Mill, showing Air-ducts for Collecting Refuse

and other refuse falls into the pit shown in the general plan, from which it is raised by an electric fan and delivered directly into the furnaces, the proportions of air and refuse being adjustable to the best relative values for complete combustion. Steam is taken from the superheater at the back of the combustion chamber.

The continuous-current generator on the engine shaft is of the General Electric Co.'s compound multipolar type, fitted with interpoles, and capable of an output of 160 KW. at 460 volts, as well as 25 per cent. overload for two hours, or 50 per cent. overload for an hour and a half.

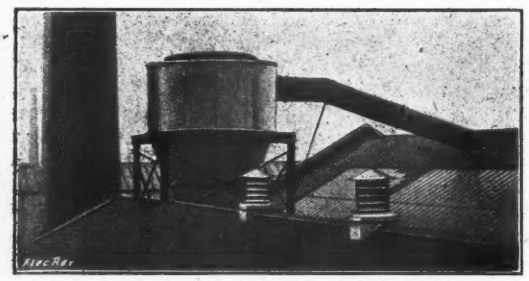


FIG. 5.—CYCLONE SEPARATOR.

Since the plant was tested on the completion of the works, a great deal of machinery has been added, but the following figures show that, with the load that existed at the time of testing, very remarkable economy was realised. When the original estimates were prepared with respect to fuel costs in Mr. Sherry's old works, which were then intended to be remodelled, and subsequently for these new mills, particular consideration was given to the type of refuse, which consisted chiefly, as mentioned, of sawdust and the short, small shavings of surfacing and moulding machines, and Mr. Sherry was promised that the new plant should give him all the power the mill. In the result, however, no coke has ever been required, and less than three-fourths of the sawdust and other refuse produced is consumed.

GENERAL RESULTS OF TRIAL (AFTER PRELIMINARY TRIALS), NORMAL FULL LOAD.

Duration of Trial, 6 hours 54 minutes.

BOILER PERFORMANCE.

Total water evaporation	21,831 lb.
Evaporation per hour	3,164 lb.
Total wood refuse fuel	7,127 lb.
Fuel consumed per hour	1,032 lb.
Rate of combustion per sq. ft. of grate ...	28.7 lb.
Average steam pressure per sq. in.	158 lb.
Average steam temperature	578° F.
Average steam superheat	209° F.
Water evaporated per lb. wood refuse fuel	3.06 lb.
Equivalent evaporation from and at 212° F.	3.95 lb.
Guaranteed evaporation per lb. of fuel ...	3.6 lb.
Draught in flues close to boiler	0.6 in.

ENGINE AND DYNAMO.

Average steam chest pressure per sq. in. ...	148 lb.
Average steam chest temperature	508° F.
Average steam chest superheat	144° F.
Vacuum, engine gauge	24 in.
Vacuum, condenser gauge	27 in.
Total steam consumption	19,851 lb.
Total steam consumption per hour	2,877 lb.
Average indicated horse-power	276
Average kilowatts	159
Steam consumption lb. per KW.-hr. ...	18.1
Guaranteed steam consumption, lb. per KW.-hr.	18.83
Wood fuel consumption per B.TH.U. guaranteed	6.5 lb.
Combined efficiency, I.H.P./B.H.P.	79 p.c.

The highest dynamo temperature, after more than seven hours' run at full load, was 140° F. on the interpoles, representing a rise of 70° F. above the atmosphere.

The voltage regulation tests showed between no load and full load a rise of 1.75 per cent., and between no load and 25 per cent. overload 2.75 per cent., the dynamo running at constant speed, without regulation of the shunt rheostat.

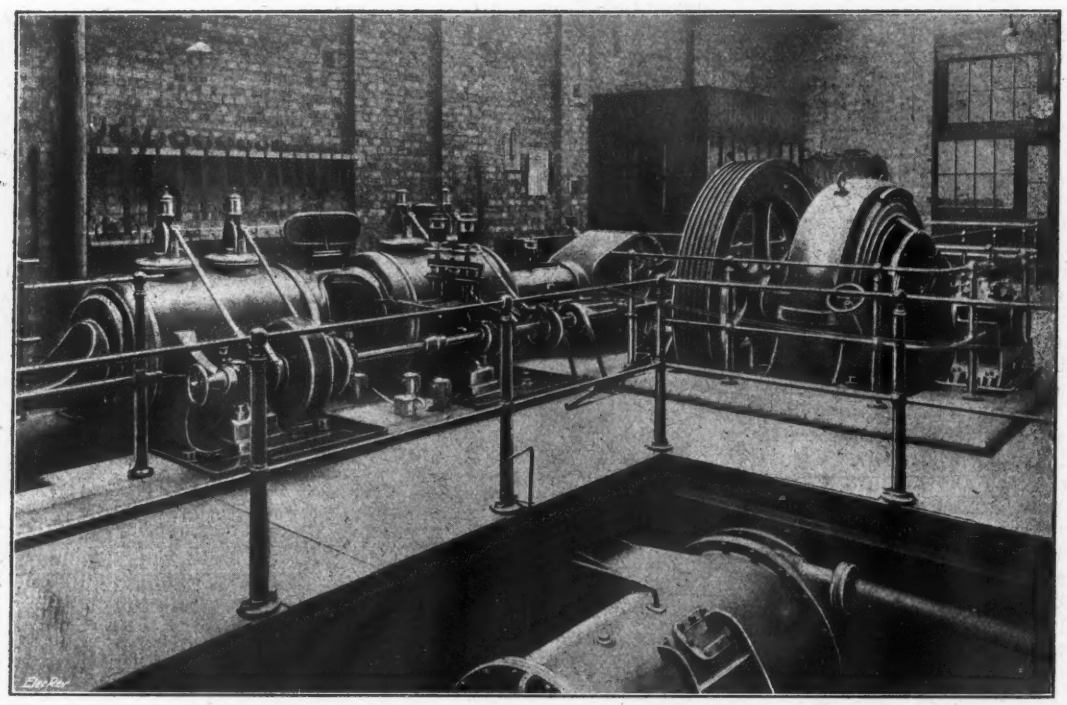


FIG. 6.—PAXMAN-G.E.-CO. GENERATING PLANT.

required for all purposes in the mill, including the provision of steam for the drying kiln (which is on the Erith system), for one-tenth of one pound of coke per H.P.-hour and all the wood refuse produced by

The contractors for the different parts of the plant were:—Engines, boilers, etc., Messrs. Davey, Paxman & Co., Ltd.; 160-KW. generator, the General Electric Co., Ltd.; switchboard and distributing

board, Messrs. Dorman & Smith, Ltd., and Messrs. Ward Bros.; pneumatic dust-collecting and delivery plant, including motor and fan, etc., Messrs. Matthews & Yates; engine and boiler foundations, and

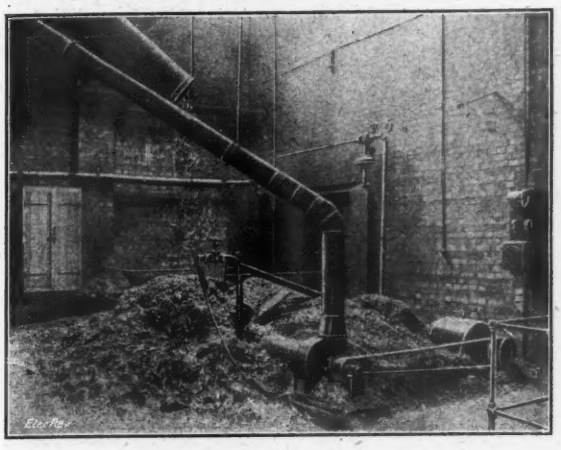


Fig. 7.—Electric Fan Feeding Boiler with Wood Refuse.

chimney shaft, Messrs. Neil & Co.; steel roof principals and wind gable ends, Messrs. David Rowell and Co.; heating apparatus in timber drying kiln, Erith's Engineering Co., Ltd.

LEGAL.

Read *v.* The Stella Conduit Co.

This case came before the Court of Appeal, composed of the Master of the Rolls, Lord Justice Phillimore, and Mr. Justice Sargant, upon the appeal of the plaintiffs from a judgment of Mr. Justice Joyce, in the Chancery Division, dismissing the action.

The plaintiffs brought the action against the defendants for an injunction, damages and ancillary relief for the alleged infringement of Letters Patent No. 18,375, of 1905, granted to Jas. William Brooks and Albert Edward Read, for "an improved means for connecting tubular electrical conduits together, and for connecting the said electrical conduits to their fittings," without screwing.

The case was reported in the Electrical Review of October 30th and November 20th, 1914.

Mr. Justice Joyce held that the gripping arrangement was a well-known and common one, and that there was no invention in the use of it in the patented appliance, and that the patent was invalid.

Mr. A. J. Walton, K.C., Mr. Colefax, K.C., and Sir Denham Warmington appeared in support of the appeal; and Mr. T. Terrill, K.C., and Mr. Arthur Gray for the respondent company.

At the conclusion of counsel's arguments on Thursday, March 30th, their Lordships reserved judgment.

Lund *v.* Hall.

Before Mr. Registrar Wild, in the City of London Court, on March 30th, a claim was made by Richard Lund, carrying on business as Lund Bros. & Co., electricians, against Messrs. A. Hall & Co., decorators, &c., Dulwich, for £1 9s., for work done and material supplied. The plaintiff's case was that he had done work upon the instructions of the defendant at St. Marylebone Infirmary, where the defendant was carrying out some work by contract, and his workmen had damaged some electric light fittings. The defendant denied giving the plaintiff any order, and said his workmen did not cause the damage in respect of which the plaintiff was seeking to charge. The case was adjourned for the plaintiff to produce further evidence, the Registrar remarking that it was oath against oath as the case then stood. When the case again came before the Court, the plaintiff called Mr. Brook, engineer of the St. Marylebone Infirmary, who said that some time last August some work was being done at the Infirmary by the defendant's men. In one of the wards the defendant's men injured the electric fittings, and it was in the defendant's contract to replace them. The defendant commissioned Messrs. Lund's men to replace the damaged fittings and to send the bill in to him. The work was done the following day. Cross-examined by the defendant, witness said it was the defendant's contract to take down the gas fittings. In the ward in which the electric fittings were damaged, he (witness) said he took down the gas fittings. In answer to the Registrar, witness said it was not in taking down the gas fittings that the damage was done; it was done by the defendant's men in washing off and whitening the walls and ceilings. The defendant said his men did not do the damage, and the engineer in question and the plaintiff were working together against him. The Registrar said that upon the evidence before him he must find that the defendant's men did the damage which the plaintiff had repaired. Judgment for the plaintiff, with an allowance of 5s. for the witness.

Baldry *v.* Sun Electrical Co., Ltd.

At the Lambeth County Court, before Judge Parry, on Monday, S. T. Baldry, aged 14 years, brought an action through his father, J. W. Baldry, engineer, of 65, Kirkwood Road, Peckham, S.E., under the Workmen's Compensation Act, for compensation for injuries, the respondents being the Sun Electrical Co., Ltd., of Charing Cross Road, W.

Applicant was employed by respondents as a learner in November, 1915. A piece of steel shaving was thrown and struck his eye. He did not see where it came from. He was taken to the Royal Eye Hospital, St. George's Circus, where his eye was removed, and he remained as a patient until February 1st.

Mr. Shakespeare, for the respondents, said the boys had nothing to do with the metals with the exception of brass. If boys were larking and an accident occurred, the Court of Appeal had decided that such accident did not arise out of, or in the course of, their employment, and therefore did not come within the scope of the Act.

Judge Parry said if that was so, they might as well shut out boys from the operations of the Act, as they were always larking. If the applicant had not been employed there he would not have met with the accident, and that, to his mind, meant arising out of, and in the course of, his employment. In view of the importance of the case, and the likelihood of an appeal, he reserved his judgment.

Lineman's Electric Shock.

Thos. Bannon, telegraphic lineman, claimed compensation at Tullamore Quarter Sessions against the Postmaster-General in respect of injuries received by his sustaining an electric shock while working at the summit of a ladder or pole and falling a distance of 18 ft. He was three months in hospital. On the suggestion of the County Court Judge, it was agreed that applicant should get half wages from December 31st to March 14th, and nominal compensation was given to keep his interests alive pending his resumption of work. Costs were also allowed.

Munitions Cases.

The Bolton Munitions Tribunal, on March 30th, heard cases against four employés of the Chloride Electrical Storage Co., who were said to have refused to work overtime on March 27th. The men said they should have a day's notice, but were not warned until the same day. They had not brought their tea with them. For the firm it was pointed out that notice was given on March 16th that overtime would be worked on March 17th and until further notice. In addition, there were instructions for foremen to provide tea for men called to work overtime at short notice. Three of the men were fined 1s., and the fourth man was cautioned.

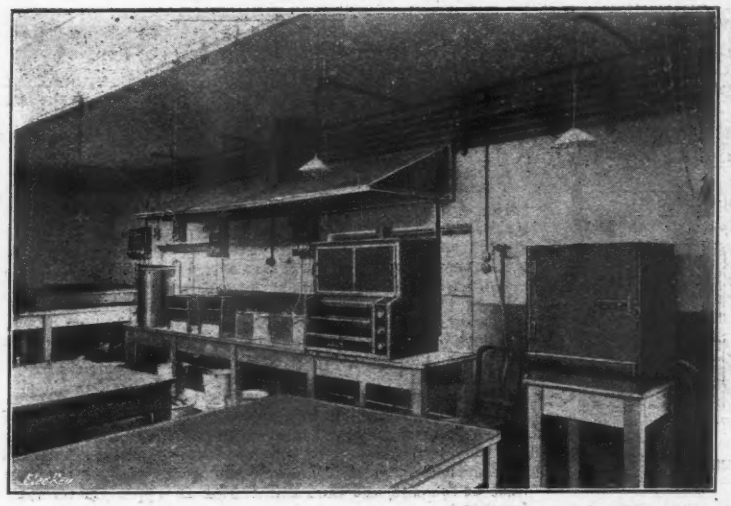
The Warrington Munitions Court fined a firm of feeding-stuff manufacturers £10 and costs for employing men from a local controlled cable works without having obtained certificates of consent.

Notes from Canada.—Our Canadian correspondent writes:—"One of the most important occurrences in the electrical supply situation in the province of Ontario, is the recent arrangement made by the Provincial Government, to purchase at a cost of over £1,600,000 all the interests of the Trent Valley power companies, whose operations cover the territory lying east of Toronto along the shore of Lake Ontario. This means that the water-power rights and properties of these companies are purchased for the people, and that they will be put directly under the administration of the Hydro-Electric Power Commission of Ontario, and it also means that with the exception of the large generating companies on the Canadian side, at Niagara Falls, practically all the large power sites and projects are now owned by the people and controlled by the Commission. As was recently pointed out in these notes, the territory at present served by this Commission is almost as large as England, while its powers, extending over the whole province as they do, cover an area three and a half times as large as the British Isles. The Provincial Government has decided to approve of the power development scheme proposed by the Commission for the Niagara River, whereby an ultimate capacity of 600,000 H.P. will be made available. For this scheme turbines and generators in units of 50,000 KW. capacity are being considered. The development of the water-powers of British Columbia is receiving careful attention at present. Existing plants have a capacity of some 230,000 H.P., and there is said to be about twelve times this power available for use. The Edmonton Power Co. proposes to construct a dam across the Saskatchewan River at a point about 75 miles west of Edmonton. There will be a head of about 80 ft. An electric railway will be built from the city to the dam.

D

ELECTRIC COOKING AT SWAN & EDGAR'S.

THROUGH the courtesy of Messrs. Swan & Edgar, the well-known drapery firm whose premises are a familiar landmark in Piccadilly Circus, we were recently enabled to inspect the extensive electrical cooking equipment which has been installed within the last few months in connection with their staff catering department.



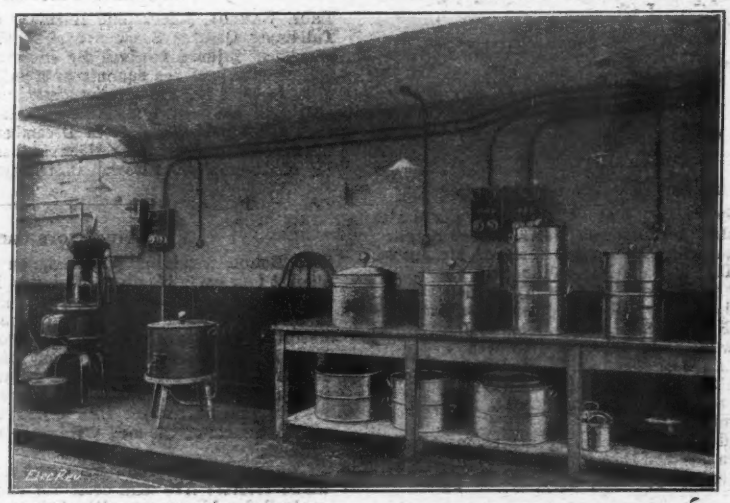
ELECTRIC STEAMER, GRILL, FISH FRYERS, &c., AT MESSRS. SWAN & EDGAR'S.

This installation has been carried out by Messrs. Locke and Soares, of 83-87, New Cavendish Street, W., the cooking equipment being supplied by the Jackson Electric Stove Co. and of their standard type.

The kitchen, which occupies a light and airy situation at the top of the building, is connected by service lifts with a servery on the floor below, where the extensive staff dining rooms are situated.

From the main switchboard in the basement, a special 220-volt 37/14 S.W.G. service is run to the top of the building to a 12-way D.P. 50-amp. per way glass fronted distribution board in the kitchen; the service is controlled by a 350-amp. Berry, Skinner D.P. switch and fuse, and a special meter. From the distribution board the circuits leading to the apparatus are carried round the walls, being run in solid-drawn heavy gauge screwed conduit, as is the case with the service leading up from the basement.

The apparatus installed includes two roasting ovens with double doors of the usual Jackson lagged type, each with a 7 KW. loading and three-heat control; a vegetable and pudding steamer of the cupboard type fitted with perforated shelves, &c.; a grill and hot cupboard, rated at 6 KW., of the standard Jackson type with three-heat control; two egg poachers for cooking 12 eggs at the same time; two fish fryers, with 9 KW. loading and three-heat control, and a 10-gallon water urn with a 6-KW. loading.

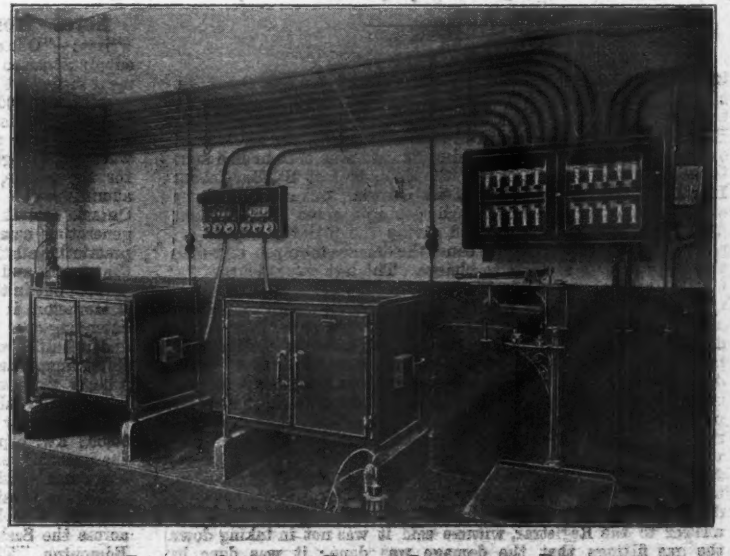


ELECTRIC BOILING EQUIPMENT AND MOTOR-DRIVEN POTATO PEELER.

Arranged along the far side of the kitchen from the entrance are a small boiling hob consisting of four hot plates of 5·5 KW. rating and four boiling pans of three and six-gallon capacity with nests of steamers above and a total loading of 10 KW., these being arranged on a bench; a large stockpot of 3·5 KW. rating stands on the floor and beside it a Cornhill potato peeler, chain-driven by a ½ H.P. motor—a piece of apparatus which will deal with a sack of potatoes in a matter of minutes.

Each unit of cooking apparatus is controlled by Diamond H switches of the series-parallel or "on and off" pattern, with Zed fuses in circuit and provided with an indicating pilot light, these accessories being fitted on the wall adjacent to the apparatus controlled and coupled to the latter by armoured flexible cable. Practically all the apparatus is provided with three-heat control, and three apparatus—a 12-gallon steamer and two 10-gallon water boilers—have seven heat control. The servery is equipped with a 5-KW. hot cupboard and carving table, two water urns, one being of the immersion heater type and a milk and coffee urn, the controlling switchgear and pilot lights being grouped on one board.

The total installed loading of the cooking installation is approximately 75 KW., and the maximum working load has, we understand, reached 55 KW.; it provides, daily, 80 breakfasts, 360 dinners, 360 teas, and 80 suppers, or a total of, roughly, 880 meals for the staff, and, we should add



ELECTRIC OVENS AND KITCHEN DISTRIBUTION BOARD.

is giving great satisfaction in use. The staff dining rooms, with adjacent sitting and smoking rooms, are dependent on electric heat, and five 3-KW. Belling fires and one of 2 KW. loading by the same maker have been installed for this purpose.

In conclusion, we are indebted to Messrs. Locke & Soares for the data published herewith.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Electric Capstan Control Gear.

The severe conditions of operation of electric capstans and winches call for extremely simple, robust and reliable control gear if satisfaction is to be given to the user.

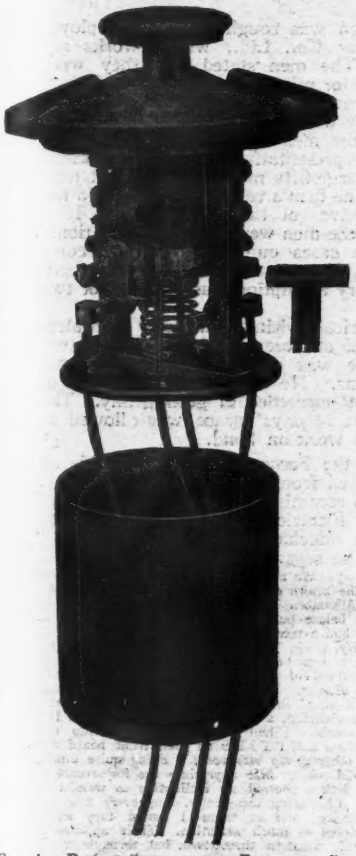


FIG. 1.—PEDAL SWITCH FOR ELECTRIC CAPSTAN.

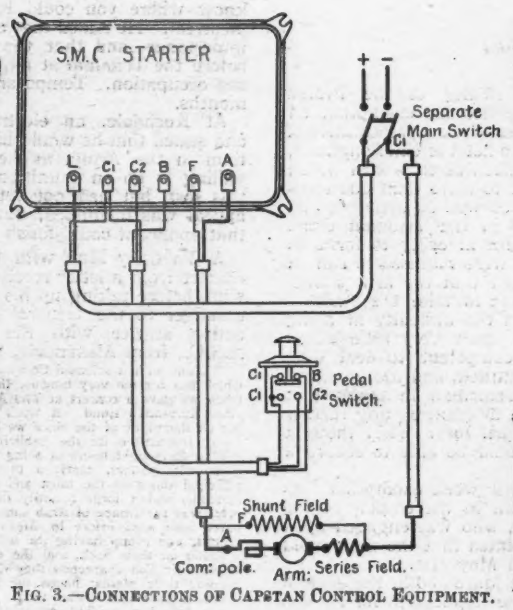


FIG. 3.—CONNECTIONS OF CAPSTAN CONTROL EQUIPMENT.

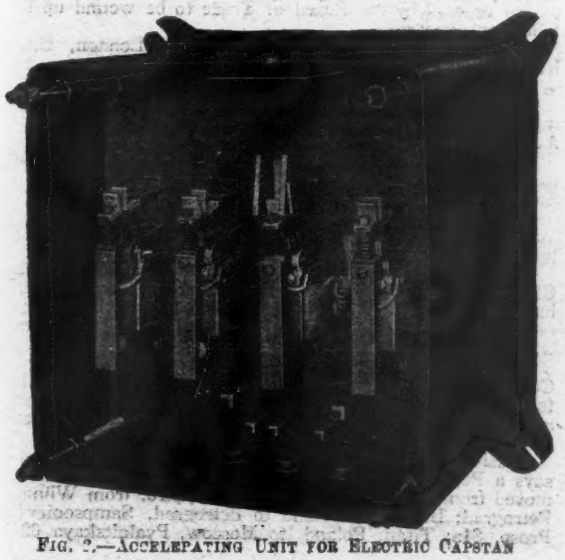


FIG. 2.—ACCELERATING UNIT FOR ELECTRIC CAPSTAN.

In order to meet these requirements the BRITISH THOMSON-HOUSTON CO., LTD., of Rugby, has developed a special control gear, of the automatic fool-proof type, which comprises a pedal switch designed for use in a covered yard or on an exposed wharf, and an accelerating unit consisting of a series of electrically-operated contactors. The pedal switch does not carry the main current, but, when depressed, closes the operating coil circuit of the first, or shunt, contactor, causing it to close and complete the motor circuit through the starting resistance.

The remaining contactors close successively, cutting out resistance automatically at the proper time.

Fig. 1 illustrates a type P, form F, capstan pedal switch designed for exposed situations, while fig. 2 shows an accelerating unit—a standard S.M.C. starter, in a ventilated iron case. Tubular form resistance units are supplied in connection with the above.

Fig. 3 shows diagrammatically a capstan control equipment arrangement.

An overload relay can be fitted to the contactor panel, and special contacts are provided on the pedal switch, in such a case, to reset the relay.

Control equipments for reversible capstans are also supplied, operated by two mechanically interlocked pedal switches, one for each direction of motion; a special triple-pole contactor, fitted with magnetic blow-outs, is supplied for use with A.C. squirrel-cage motors, which can be connected direct to the line through such a contactor.

Belling Cooking Apparatus.

MESSRS. BELLING & CO., of Edmonton, N., have recently issued a leaflet dealing with their electric kitchen appliances, including

FIG. 4.—BELLING GRILLER-TOASTER.

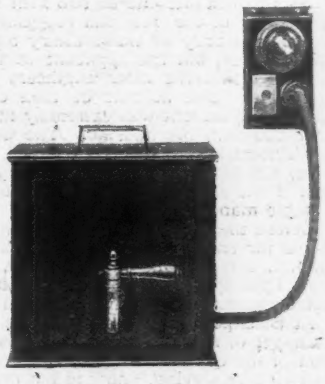


FIG. 5.—BELLING ELECTRIC WATER TANK

the Belling oven, griller-toasters, hot-plates, electric water-tank, &c. A recent introduction is a low-priced griller-toaster, fig. 4, to meet the needs of the small householder. The top is available for keeping things warm, while cooking is proceeding underneath, on the grill; a drip-pan and grid (10 in. × 8 in.) are provided, and three heating elements are fitted, giving a 1½-KW. loading, and 4 ft. of cable are supplied with the apparatus.

A large and more substantial apparatus of the same kind, with 3½-KW. loading, is also supplied.

Fig. 5 is a 2-gallon electric water-tank, made in polished copper, with removable lid. This has a 2 KW. loading, and is supplied with a control panel fitted with a three-heat switch, fuse, plug and socket, &c.

Indicating Crane Signal.

In large shops where cranes are continually moving back and forth, workmen naturally waste considerable time watching in what direction the cranes are moving. To reduce this waste a signalling system for indicating whether the cranes are moving forward or backward has been developed. The outfit consists of red and green lanterns mounted on both sides of the crane, the lamps of which are connected to the motor circuits. The red lanterns of one side and the green of the other side are connected to the same circuit, with the system so designed that when the crane moves in one direction one set of lamps is automatically lighted, and when the motor runs in the other direction the other set is lighted. Thus, when a person is in a certain position, and the red lantern is lighted, it indicates that the crane is approaching him, and if the green lantern is lighted, the crane is departing. When

the crane is standing still, no lights are shown. The number of lanterns employed is optional—three on a side for each colour being generally used. When the cranes are equipped with indicating signals, it only takes a glance to determine definitely whether the crane is approaching or departing, the workmen knowing instantly whether they are in danger or not. The indicating signals are said to be very useful to operators of neighbouring cranes, minimising the possibility of collision, and enabling the operator to give practically all his attention to the floor level, since the signals come automatically within his vision with the approach of another crane, thus relieving him of strain, and greatly increasing the general safety. The device is being made by the Nicholson-Lintern Co., Cleveland, Ohio.—*Electrical World.*

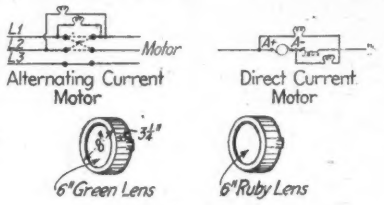


Fig. 6.—Diagrams of Connections for Crane Signal.

WAR ITEMS.

Exemption Applications.—At a sitting of the Batley Tribunal last week, a local firm applied for exemption on behalf of an electrician and an engineer. The representative of the firm stated that the engineer was not the chief engineer, but it was thought that a concern such as that with which he was connected should be entitled to more than one engineer to attend to two large engines as well as dynamos and motors. He wished the members of the Tribunal could spare time to inspect the firm's plant in order to form an idea as to whether one or two men were required to run it. A member of the Tribunal suggested that the firm should secure somebody of non-military age to take the place of the engineer, but the applicant said the difficulty in doing that was that the older engineers knew very little about electricity. The number of men competent to deal with alternating current was extremely limited, and the applicant firm had both D.C and A.C. The Chairman intimated that the Tribunal were strongly opposed to granting any further time, but they would allow until April 15th. They thought that if the firm advertised they would be able to secure a suitable man.

Before the Doncaster Tribunal last week exemption was asked for on behalf of an electrician in the employ of the G.N.R. carriage and wagon works, who was engaged upon train lighting. The Railway Co. stated that the man could not be spared. Postponement until May 31st.

At Blackpool Appeal Tribunal, on March 30th, the general manager of the Tower supported the application for exemption of the electrical engineer and his chief assistant. They had 70 men serving, and had not appealed for a single man. Temporary exemption was granted until the end of October.

At the Durham County Appeal Tribunal, held at Darlington, an electrical engineer in business at Stockton asked for an extension. One partner was already in the Army, being chief electrical engineer in the Northern Command. At the beginning of the war they employed six men, all of whom had joined the Colours, save one who was engaged on munitions. An arrangement was made that whichever of the partners was first accepted for service, the other would remain and try to keep the business going. Appellant was the only one left in the business. He was not unwilling to serve. It was a question entirely of serious financial and business obligations. He asked for three months, and then, even at great sacrifice, he would follow his partner. The parents of the partners would have to sacrifice the money advanced to establish the business. Three months' extension, from March 14th.

At the Middlesbrough Tribunal, an electrician, trading as an electrical contractor, contended that, in view of his business he was a starred man. He had an invalid wife and child dependent on him, and the allowance which he would receive from the Government in the event of his joining the Army would be quite inadequate. Postponed until April 30th.

At the Portsmouth Tribunal, an electrician appealed on behalf of his apprentice aged 19, on the ground that he was indispensable, owing to the shortage of electricians, and to his being engaged in Government work. The case was adjourned so that the employer could apply to the Minister of Munitions for a ruling as to whether the occupation of an electrician is considered a starred one or not.

At the Erpingham Tribunal, Lord Suffield, through his agent, appealed for his electrician, aged 28, single, who has charge of a valuable electrical plant at Gunton Hall, and also of a gas plant. The claim was made on the ground that if the man had to go it would be a serious hardship to his employer, as he could not be replaced. Exemption was refused.

The Grantham Tribunal has granted conditional exemption, until July 1st, to two employés (switchboard attendants) of the Urban Electric Supply Co.

At Canterbury, on March 27th, Mr. Dashwood, electrical engineer, applied for exemption of an electrical wireman, who had six months of his apprenticeship to complete. Mr. Dashwood stated that he had already released six men, and applicant was the only man of military age left. The Military declined to regard the occupation as being on the reserved list. A month's exemption was granted.

The Wakefield Tribunal have granted varying periods of exemption—in the majority of cases total exemption so long as the men remained in their present employment—in respect of 52 employés of the Yorkshire (West Riding) Electric Tramway Co., who stated that the men were mostly skilled workmen employed at the tram depôt, and were absolutely indispensable to the proper working of the tramway system.

At Dukinfield, exemption was sought for two employés of the Tudor Accumulator Co., Ltd., whose works are Government controlled. The men stated that they were engaged on casting plates for miners' electric safety lamps. A representative of the firm stated, in answer to questions, that their hands were fully occupied, and it was not a fact that they were working the men only six hours per day. Ald. Garner (a Military representative): We are informed the firm could easily discharge fifty men at the present time without inconvenience. The firm's representative: I do not know where you could have got that information. It is incorrect. He added that the men were on work of national importance, and that the cases ought not to have come before the Tribunal at all, because the men were in a certified occupation. Temporary exemption was granted for two months.

At Rochdale, an electrical wiring contractor appealed, and stated that he would be of more service in a shell factory than in the Army, as he was a skilled turner and was willing to go on munitions. He had applied for work of this sort, but had not yet succeeded in getting any. The appeal was dismissed, but 14 days' grace was allowed so that applicant could finish work on hand.

A Publicity Man with the Forces.—The following is an extract from a letter received from Lieut. A. R. Courtenay, who, before taking up his commission, was acting publicity manager to the General Electric Co., Ltd. Writing, on active service with the Mechanical Transport (M.T.) A.S.C., from Alexandria, he says:—

"I am with a splendid Company. We run our own Pierrot Concert Party, which has become very famous, the zenith of our fame being reached recently when we gave a concert at The Alhambra Theatre in aid of the United Services Recreation Fund. A week before our name was practically unknown, but on the night of the show we had a record full-house and took over £100. Being responsible for the publicity work, I was thoroughly in my element. Within forty-eight hours of being told to 'carry on,' I had the town painted green with posters, nearly a thousand of which were distributed to all the principal shops in the town and district. These were backed by 5,000 small handbills and a large quantity of small invitation tickets. The stunt, however, was my troupe of Arab sandwichmen, a method of publicity which had never been seen before in Alexandria. I had 14 in all, divided into two groups, one group having the letters E M P T I E S on their front board and a poster on their back, and the other group *vice versa*. Being quite unable to read English characters they did not at first appreciate the importance of keeping their places; hence the letters showed an inclination to wander at times, until I had drilled them. Chattering incessantly, they every now and again hailed a passing acquaintance, and at times I feared they would obstruct the traffic, as they attracted so much attention. Their appearance caused endless amusement, not only amongst themselves, but throughout the town generally. Considering there are no English compositors here, the printed matter was turned out very creditably."

Companies to be Wound Up.—In the latest list of companies ordered by the Board of Trade to be wound up the following appear:—

Veithardt & Hall, Ltd., 41, Eastcheap, London, E.C., iron and steel importers. Controller: A. J. Foster, 37, Wallbrook, E.C.

Gustav Rosenmann, 194-200, Bishopsgate, E.C., hardware merchant. Controller: N. W. Wild, 22-28, Broad Street Avenue, E.C.

C. F. H. Müller, 47, Red Lion Street, W.C., manufacturer of X-ray tubes. Controller: H. L. H. Hill, 2, Broad Street Place, E.C.

London Electron Works Co., Ltd., Regent's Dock, Limehouse, London, E., dealers in old tin. Controller: A. Taylor, Thames House, Queen Street Place, E.C.

French Industries.—The "Times" states that M. Clémentel, French Minister for Commerce, has recently instituted a technical organisation to deal with all questions relating to such industries as are not exclusively concerned with war purposes.

Swedish Export Prohibitions.—The Swedish Chamber of Commerce for the United Kingdom announces that the following articles have been added to the list of goods which are now prohibited for export from Sweden:—Calcium carbide, nitrogen carbide.—"Times."

Russian Electrical Companies.—Owing to military events, says a Petrograd paper, the Dvinsk Electrical Co. has removed from Dvinsk to Orel; Y. A. Shapiro, from Wilna to Petrograd; B. Petsh, Poland to Petrograd, Sampsonievsky Prosp. 84a; Titan, Poland, to Moscow, Pyalnitskaya 62.

Thanks from the Front.—A correspondent with the British Expeditionary Force says:—"The "Electrical Review" continues to reach me regularly each week, and is very welcome too, I assure you. Mr. Carter's article in last week's issue on the resistance of a cube was very interesting. I manage to find time, during odd minutes, to wrestle with such problems, and to digest the various technical articles—in fact, there is not much of the paper that goes unread. The other day I happened across a man who, in normal times, is on the constructional staff of the Westinghouse Co. We had a brief chat, and he was quite pleased to have one or two back numbers of the "Review" that I was able to give him."

After-the-War Trade.—In reply to a Parliamentary question, Mr. Runciman says that the Government fully appreciates the importance of preserving and extending British trade in neutral markets. The subject will come under the consideration of the special committees which are being appointed to inquire into the position of certain important branches of British industry after the war. In addition, Mr. Ainscough, who has recently completed a commercial mission in China on behalf of the Board of Trade, has been closely in touch with important British firms trading with the Far East, and will be glad to receive further information as to their views.

Municipal Corporations and Enemy Companies.—The Blackpool and Eccles Corporations propose to follow the lead of Manchester by adopting standing orders to the effect that no contract shall be entered into with any person of German or Austrian nationality, and no contract shall be entered into with any firm or company whose subscribed capital (whether by way of shares or otherwise) is held or controlled to the extent of one-third or upwards by persons of German or Austrian nationality. Heywood Corporation G.P.C. has rejected a proposal in the same sense by ten votes to eight.

BUSINESS NOTES.

Dissolutions and Liquidations.—Adnil Electric Co., Ltd., Adnil Building, Artillery Lane, Bishopsgate, E.C.—The report of Mr. H. E. Burgess, Official Receiver, in this matter, has now been issued to the creditors and shareholders. The compulsory winding up order was made last October on the petition of a creditor, and accounts have been lodged showing liabilities £34,333, assets expected to produce £28,591, and a deficiency of £15,741 with regard to contributories.

According to the Official Receiver's report the company was registered on June 29th, 1909, as a private company, and was formed to carry on the business of electrical engineers and dealers in electrical appliances. It held the agency for this country for the Bergmann-Elektricitäts-Werke, of Berlin (hereinafter referred to as "the Bergmann Co"). The directors of the company were P. Berthold, J. Hissink and E. S. Morgan, all of the Bergmann Co. On the incorporation of the company, S. G. Leach and R. A. Marples were appointed joint general managers, but they were not directors. Although not strictly so in form, the company might be described as a reconstruction of Marples, Leach & Co., Ltd. (the "old company"). That business was founded in 1904 when it acquired the sole agency in this country for the Bergmann Co., and it was registered as a private company on April 6th, 1908. Debentures for £7,500 were issued, and on May 14th, 1909, the old company went into voluntary liquidation. The liabilities, in addition to the debentures, amounted to £24,408, of which £23,305 was due to the Bergmann Co. As a result of the liquidation the debentures were paid off in full, and the ordinary creditors received dividends amounting to 7s. 9d. in the £. The Bergmann Co. provided £9,001 out of a total of £9,520 required to pay the dividends referred to, and the transaction took the form of a payment as the purchase price of the stock. Mr. Leach explains that the reason why the Bergmann Co. appear as such large creditors is that on the liquidation they purchased the claims of all the English creditors, who thus received 20s. in the £, the loss of 12s. 3d. in the £ falling on the Bergmann Co.

After the incorporation of the Adnil Co. the question of the acquisition of the goodwill of the old company appears to have been considered, and resolutions are recorded in the minute-book, under date, Berlin, July 2nd, 1909: That Messrs. Marples & Leach should make arrangements with the Receiver for debenture-holders and/or liquidators of the old company to pay him, or them, for the transfer of any orders coming in a commission of 5 per cent. This arrangement to continue until superseded by any arrangement to purchase the goodwill. Berlin, August 18th, 1909: It was resolved to acquire the goodwill of the old company, the consideration to be such a sum as should represent the net profits made by the old company for the two years preceding the liquidation, &c. It does not appear from the books of the company that these resolutions were ever carried out; in fact, the only relevant entry in the books which the Official Receiver has been able to trace is an item of £45, which was credited on July 1st, 1910, not to the Receiver or liquidator of the old company, but to the Bergmann Co., in respect of the 5 per cent. commission referred to in the resolution of July 2nd, 1909, and debited to the goodwill account. But on June 30th, 1910, a goodwill account was opened, and a sum of £7,500 was debited to that account, and credited to the Bergmann Co., the figure being described as the loss in the liquidation of the old company, presumably the loss incurred by the Bergmann Co. Of the £7,500, £1,500 was subsequently transferred from goodwill account to fixtures, machinery, and tools account, thus reducing the goodwill to £6,000, and from that date there has always appeared in the books and accounts of the company an item of "goodwill £6 000" and a special credit to the Bergmann Co. of that amount. It was intended that this goodwill item should be written off from profits each year, but no reduction of it appears to have been made. It is not clear upon what grounds the Bergmann Co. thought themselves justified in putting upon the shoulders of the Adnil Co. the loss they had incurred in connection with the old company, for that appears to be the effect of the entries above described. There is no evidence that they had ever bought its goodwill; nor can it be suggested that the credit raised in their favour was in consideration of their allowing the Adnil Co. to use the stock which the Bergmann Co. had bought from the liquidator of the old company, for there is evidence that the stock was acquired by this company quite apart from the goodwill transaction, thus:—On June 28th, 1910, £7.096 was credited to the Bergmann Co.'s stock account, and debited to this company's goods account in respect of the stock purchased from the liquidator of the old company.

All the directors being in Germany the Official Receiver has had no opportunity of examining them, and his opinion is therefore based upon the facts as recorded in the books, but as at present advised he can see no grounds for any valid claim by the Bergmann Co. against the company in respect of the £6,000 before referred to, which is included in the unsecured debts now owing. This, however, is a matter which will have to be dealt with by the liquidator.

The nominal capital of the company is £10,000 in £1 shares, all of which have been issued, and are fully paid up. There are only three shareholders, the two signatories to the Memorandum and Articles of Association, who hold one share each, and the Bergmann Co., who are registered as the holders of 9,998 shares. Of the amount payable on the shares £1,000 was paid in cash by the Bergmann Co. in June, 1909, and £1,700 was paid to the company by the Receiver of the old company, but credited to the Bergmann Co., in September and October, 1909. The balance of £7,300 was paid by the Bergmann Co. on June 27th, 1911, but on the same day a cheque for £7,300 was paid to the Bergmann Co. on account of the amount due to them for goods supplied. No debentures were issued by the company. According to the accounts, which were audited annually by a firm of London chartered accountants, the results of the trading from the formation of the company were as follows:—Year ending June 30th, 1910, loss £178; June, 1911, loss £62; June, 1912, profit £639; June, 1913, profit £1,025; June, 1914, profit £245. In the year ending June 30th, 1913, a dividend at the rate of 5 per cent. per annum was paid, free of income-tax. No other dividends appear to have been paid. Shortly after the outbreak of war Messrs. Leach & Marples, the joint general managers, discovered that, owing to the company's German connection, the customers would no longer give any orders to the company, but many of them stated that they would have no objection to giving orders to Marples & Leach personally, upon their undertaking that no benefit from the orders should go to the Germans interested. There was a large stock on hand, and Marples & Leach thereupon began to take and carry out orders in the name of "Marples & Leach." The stock required to enable them to carry out these orders was taken from the company's stock, at stock book prices, and although in the absence of any directors it was impossible for them to enter into any written contract with regard to the matter, the arrangement they had in view was that they should pay the company one-third of the gross profit on such orders in respect of their use of the stock, offices, staff, &c. In cases where it was necessary to purchase material for the carrying out of these orders the company paid for it, and "Marples & Leach" used it on the terms above stated. They opened a separate bank account in the name of "Marples & Leach" in connection with the business so carried on, and paid all proceeds of such trading into the credit of that account. It was also arranged that for the protection of the company cheques on the "Marples & Leach" account should be countersigned by the company's auditor. At the date of the provisional winding-up order there was a sum of £4,887 standing to the credit of the "Marples & Leach" account, which was handed over to the Official Receiver. Mr. Marples left the company's service in June, 1915. An item "other liabilities, £1,216," shown in the statement of affairs, represents the claims of Messrs. Marples and Leach for a share of the gross profit above referred to. These claims will be dealt with by the liquidator.

In August, 1915, a proposal was made to the special manager by S. G. Leach for the purchase of the goodwill, stock, furniture and fittings of the business. The offer was considered at a meeting of the principal creditors of the company in this country, and an application was made to the Court, which made an order approving the sale to Mr. Leach. On October 12th, 1915, an agreement was entered into between the company and S. G. Leach and another for the sale to them of the goodwill, stock, furniture and fittings. The sum of £500 was paid on the signing of the agreement and the balance of the purchase price (about £3,390) is payable by monthly instalments for two years from December 1st, 1915. The book debts are not included in the sale. The failure of the company is directly attributable to the war. Mr. Leach states that the company had never done so well as in the early months of 1914. After war commenced, he and Mr. Marples did all they could to preserve it, but without avail, and in the absence of the

directors they found it impossible to carry on the business any longer. The claims of the creditors are entirely on trade accounts, except £128 due for rent, and £6,000 shown by the books to be due to the Bergmann Co. on goodwill account. The total amount shown by the books as due to the Bergmann Co. is £27,706, including the £6,000 referred to. There is also £1,965 stated to be due to the Deutsche Telephone Werke G.m.b.H. of Berlin, which, the Official Receiver is informed, is not connected in any way with the Bergmann Co. As the result of the statutory meetings of creditors and contributories, reported in the ELECTRICAL REVIEW for March 3rd, the Court has appointed Mr. J. H. Stephens, of 6, Clement's Lane, Lombard Street, E.C., as liquidator of the company.

[We understand that the report which appeared in our issue of March 3rd, although strictly accurate, is likely to give a wrong impression. Mr. S. G. Leach ceased to be associated with the Adnil Co. in October last, when he formed an entirely new company under the title S. G. Leach & Co., Ltd., to take over the goodwill, fittings, fixtures and stock-in-trade of the Adnil Co., under agreement with the Official Receiver, thus securing for a company which is entirely British (capital, directors and staff), having no enemy interests whatever, either direct or indirect, the business which during the last seven years has been held by the Germans. We understand that somebody has been suggesting that the new firm are preserving the business for the benefit of the Germans, but we are assured that far from that being the case, the new concern in actual fact represents an effort to get back a business which was originally founded by Englishmen, but through force of circumstances, fell into the hands of the Germans.

In the above Statement of Affairs, it is mentioned that the old firm of Marples, Leach & Co., Ltd., paid a dividend of only 7s. 9d. in the £, but Mr. Leach calls our attention to the fact that all the British creditors were paid 20s. in the £, and this was the condition made by the shareholders of Marples, Leach & Co., Ltd., to the Bergmann Co., in surrendering their shares to them at the Marples, Leach & Co., Ltd., liquidation. Mr. Leach says: "It suited the Bergmann people to allow the liquidation to take 4-5 years to finish, and with one of their own servants—Mr. George Ambach—as co-liquidator, they were practically in the position to declare any dividend which pleased them. In this way the 7s. 9d. statement rather places the Marples, Leach & Co., Ltd. liquidation in a light which is not strictly accurate, nor fair to Marples & Leach. It is also to some extent affecting the new company which, of course, is now in no way connected with the Adnil Electric Co., Ltd., (in liquidation)."]

ELECTRO-STEEL FOUNDRIES, LTD., Darlaston.—A dividend of 20s. in the £ is payable at the office of the liquidator, Carey Street, W.C.

Book Notices.—"Technological Papers of the Bureau of Standards." Nos. 52, 54 and 55, "Electrolysis and its Mitigation"; No. 56, "Protection of Life and Property Against Lightning." Science Papers: No. 259, "A New Relation derived from Planck's Law"; No. 266, "Preparation of Pure Iron and Iron Carbon Alloys." "*Bulletin* of the Bureau of Standards." Vol. XII. No. 3. February 3rd. Washington: Government Printing Office.

"Whittaker's Arithmetic of Electrical Engineering." London: Whittaker & Co. Price 2s. net.

We have received a copy of No. 1 of a new sixpenny monthly journal, known as *The British Manufacturer*. Its object is to promote trade in the Empire and beyond, and it contains a number of articles which should interest those who are concerned with export trade matters.

"Electric Bells and Telephones." By B. E. Jones. London: Cassell & Co., Ltd. Price 1s. net.

"A Treatise on Electricity." By F. B. Pidduck. London: Cambridge University Press. Price 14s. net.

Thomas Alva Edison. By F. Rolt-Wheeler. London: Macmillan and Co., Ltd. Price 2s. net.—This is a "live" story about a "live" American, one of the most notable of those whose biographies are given in this series of "True Stories of Great Americans," which, by the way, includes Christopher Columbus. The subject is held up as "the typical American"—practical, enterprising, utilitarian, self-made, a glutton for work, inquiring to the last degree; like Newton, he was regarded as a dunce at school, and throughout his life mathematics has been his pet aversion. He had, however, an aptitude for making use of the acquirements of others, which was invaluable to him in the development of his great undertakings. But we do not propose to follow the author through the wonderful career of the great inventor; suffice it to say that the tale is told in a most interesting fashion, and is brought right up to date, for the last episode recorded in the book is the story of how Edison found a way of producing carbolic acid from American coal, in the spring of last year, when faced with the stoppage of supplies by the European War. The story of his life is a most fascinating one, and is here so admirably treated, that we can cordially recommend the book to our readers.

Bankruptcy Proceedings.—G. E. BONNER, electrical engineer, Palmers Green, Middlesex.—The adjourned public examination of this debtor was held at the Court House, Edmonton, on April 3rd, but no further questions were asked, the debtor merely signing his evidence.

New Russian Electrical Company.—The Erg Electrical Factories Co. is being formed for the manufacture and exploitation of electrical equipment; capital, 250,000 roubles. It will take over the business of Prince I. D. Avaloff & Co., Petrograd.

The Industrial Development of India.—In a Parliamentary reply to a question regarding the Commission to inquire into the economic resources of India, Mr. Chamberlain says, according to the *Times*:—"I understand that the Commission will be asked to report on the possibilities of further industrial development of India, and in particular, first, as to possible new openings for the profitable employment of Indian capital; and, secondly, whether the Government can usefully give encouragement by providing technical advice, by practical demonstrations in the case of particular industries, by financial assistance, or by any other means not incompatible with the existing fiscal policy of India."

Catalogues and Lists.—MESSRS. ROSE BROS., 25-27, Milton Street, London, E.C.—Temporary catalogue of electric pocket and hand lamps, scientific novelties, Fulmen educational working models, also of measuring instruments made by the Compagnie F.A.C. Da Dutilh, Paris.

MESSRS. FALK, STADELMANN & CO., LTD., 83-87, Farringdon Road, London, E.C.—Catalogue No. 409 (24 pages), giving illustrated particulars and prices of "Efesca" lanterns for half-watt and vacuum tungsten lamps for street, shop interior and exterior, and industrial lighting. Copies will be sent to any reader interested in the lighting of munition or other factories.

MESSRS. DRAKE & GORHAM, LTD., 66, Victoria Street, London, S.W.—Eight-page pamphlet (No. 240), giving illustrated particulars and prices of a number of vacuum cleaners—the "Santo," the "Econo," the "Little Briton," and the "Premier."

SWEDISH GENERAL ELECTRIC, LTD., Canada House, Kingsway, London, W.C.—April, 1916, stock lists of D.C. single-phase and polyphase motors and generators that are in London ready for delivery.

MESSRS. H. DUNOD & E. PINAT, 47 and 49, Quai des Grands-Augustins, Paris.—Summarised extract from their general catalogue of books, list of works recently published or reprinted, and prospectus of the "Agendas Dunod."

Trade Announcement.—MESSRS. EDWARD LE BAS AND CO., of Dock House, Billiter Street, E.C., have taken up the sole selling rights for Great Britain for "A.P.M." patent asbestos protected steel sheets, &c.

For Sale.—The Coventry Corporation Electricity Department has for disposal one 600-KW. McLaren-Siemens and one 600-KW. McLaren-British Westinghouse generating set. See our advertisement columns to-day.

LIGHTING AND POWER NOTES.

Atherton.—STREET LIGHTING.—The U.D.C. has decided to ask the South Lancs. Tramway Co. to arrange for the lighting of all the electric lamps on the tramway poles in the district, in order that the Council may obviate the need for lighting the gas lamps on tramway routes.

Bridlington.—PRICE REVISION.—The T.C. has decided to revise the electricity charges as from the June meter readings. For lighting the price will vary from 5½d. per unit for the first 500 units per quarter, to 4d. per unit for over 1,500 units. The heating and cooking rate will be 2d. to 1½d. per unit, according to amount.

Bo'ness.—PROPOSED LOAN.—The Public Works Loan Board has replied to the T.C., which asked for a loan of £14,500 for the proposed electricity works extension, that it is unable to accede to the request. Recently the Council submitted a proposal for a loan to various banks and insurance companies, but the replies were unfavourable, the parties approached having no funds at present in hand. The Council has an application pending before the Secretary for Scotland for sanction to a loan which it is apparently quite unable to procure.

Continental.—AUSTRIA-HUNGARY.—A census of electric machines has been ordered in Hungary, and all owners are required to declare their existing stocks of motors, electric machines and apparatus, in order that the latter may be requisitioned by the military authorities.

GERMANY.—Electricity supply is to be made a Government monopoly in Saxony, the Government intending, it is said, to lay before the Landtag a Bill to this effect. The State will undertake the distribution of electricity, hoping thus to obtain a new source of revenue. Municipal and private owners will be indemnified. The total cost of the purchase is estimated at 62,500,000 francs. In anticipation of the realisation of this scheme, the State has already purchased from the City of Leipzig the collieries owned by the latter at Lausitz and near Regis.—*L'Industrie Electrique*.

ITALY.—A new central station has been completed for the Volturno municipality. This is equipped with three 6,000-KW. three-phase transformers, for transforming energy received from Capo Volturno, and it further contains a stand-by generating plant, consisting of three 1,200-KW. Diesel engines, coupled to three-

phase alternators and a smaller auxiliary 120-KW. Diesel set of the same type. The plant was supplied by the Italian Oerlikon Co. and Messrs. Sulzer Bros. The building will be much enlarged when the second Volturno waterfall is brought into use.

SWEDEN.—According to a return lately issued by the Swedish Water Power Association, new water-power utilisation plants to the extent of 28,000 H.P., exclusive of the Government works at Porjus and Alfkarleby, were last year completed in Sweden. The major portion of the new plants, 12,000 H.P., was in connection with the timber, wood pulp and paper industries; 9,000 H.P. was in connection with the iron and mining industries; 1,500 H.P. for the chemical industry; 500 H.P. for the textile industry, and 5,000 H.P. was divided over various other industries.

Derby.—PROPOSED LOANS.—The T.C. has applied to the L.G.B. for sanction to loans of £3,000 for motors, and £1,000 for mains, required for urgent service.

Dublin.—THE ELECTRICITY UNDERTAKING.—Writing in reply to strictures on the city electricity undertaking by the *Irish Independent*, Mr. J. J. O'Neill, chairman of the Dublin Electricity Supply Committee, denies that there was a deficit of £27,000 on the working for the nine months ended in December last, and asserts that, as a fact, there was a profit of about £3,000. As to the description of the refunding of cost of a new service by a prospective consumer as "extraordinary," he admits that it is not the ordinary arrangement in Belfast and in English cities, where, he says, the consumer has to pay at present the cost of the service and receives no refund, whereas in Dublin the cost is paid back to him in instalments which leave the Corporation without loss on the transaction. As it is not possible to raise any loan just now, the Committee adopted this method as most reasonable to the consumer.

The *Independent* says the Committee's report, signed by Mr. O'Neill, gives the total payment for the nine months to December 31st as £99,643, and the receipts as £72,673, and wishes to know, if the undertaking is conducted with the good results Mr. O'Neill attributes to it, "why the Committee refrained from submitting estimates for the coming year." The journal also asks why Mr. D'Alton's report to the Special Investigation Committee is not published officially.

STREET LIGHTING.—The Public Lighting Committee of the Corporation has been considering the best means of curtailing the expenditure on the street lighting during the next 12 months, the City Council having been obliged to reduce by £4,000 the amount to be provided for the purpose. The Committee has decided that the arrangement likely to cause the minimum of inconvenience to the public would be the complete discontinuance of the lighting of a proportion of the street lamps for the coming 12 months rather than the serious reduction of the lighting hours of all the lamps.—*Irish Times.*

East Ham.—The Finance Committee of the Corporation has had under consideration the question of increasing the price of energy used for public lighting, but has deferred the matter for the present.

Ilford.—LOAN SANCTION.—The L.G.B. has now sanctioned a loan to the U.D.C. of £870 to defray the cost of an electrical engine room at the refuse destructor.

Kingston-on-Thames.—REVISED TARIFF.—The Lighting Committee of the T.C. reports having further considered the mode of charging for the supply of energy, and states that it has adopted the following scale:—Lighting, first 3,000 units a year, 6½d. per unit; second 3,000, 6d.; third 3,000, 5½d.; fourth 3,000, 5d.; all over 12,000, 4½d. Basement lighting, first 3,000, 3d.; second 3,000, 2½d.; all over 6,000, 2½d. Power, heating and cooking, first 10,000, 1½d.; second 10,000, 1¼d.; next 50,000, 1¼d.; second 50,000, 1¼d.; all over 120,000, 1d. A transformer and automatic circuit breaker are to be obtained at a cost of £164.

Lancaster.—PRICE INCREASE.—The T.C. has decided to increase the price of electricity for lighting from 4½d. to 4¾d. per unit; for general motive power, from 2½d. to 2¾d. per unit; and for large consumers an increase from a third of a penny to a halfpenny per unit, in addition to the standing charges. The question of increasing the charge to the Tramway Committee is in abeyance.

Leicester.—YEAR'S WORKING.—The accounts for the year ended December 31st last show that 6,937,190 units were generated at the Aylestone Works, 5,314,409 units being sold, this including 3,029,391 units sold for power and lighting. The total revenue amounted to £46,257, a slight reduction on the previous year, while the total costs amounted to £26,881, some £3,200 increase on the previous year (when about 300,000 extra units, practically all for power, were sold). The gross profit, £19,376 was absorbed in meeting interest, sinking fund, and appropriations of £3,000 for a new boiler, &c., and £752 to reserve. The reserve fund in hand, in addition to the above, amounts to £10,911.

The Aylestone station supplied 1,312,400 units to the Lero station. The Lero station had an output from steam plant of 15,370,954 units, of which 1,324,698 units were required for station plant, 7,380,179 units were supplied to power consumers and the balance to the tramways undertaking. The power consumers supplied from the Lero plant numbered 260, with 9,100 H.P. of motors. The total costs of the Aylestone undertaking averaged 1·23d. per unit; the receipts were 2·13d. per unit, and the surplus (£3,752), after meeting interest, sinking fund, &c., was ·173d. per unit. The overall costs of the Lero station, including interest and sinking fund charges, were ·62d. per unit, and an average of ·84d. per unit was received for the power units sold, the surplus (on power supply only), after allowing for distribution, interest and sinking fund charges on cables, &c., being ·098d. per unit, or, roughly, £3,000, which is incorporated in the tramway accounts.

London.—At the City Corporation meeting, last week, a resolution was adopted instructing the Streets Committee to take the necessary steps to oppose the application of the Charing Cross Electricity Supply Co. to the B. of T. for consent to increase the maximum lighting rate. An amendment that it be referred back to the Streets Committee for reconsideration was rejected by one vote (82 to 81), and the original motion carried. In moving the amendment, the Chairman of the Streets Committee pointed out that the company was paying 60 per cent. more for coal, and that the costs of labour had considerably increased, and the Committee considered the increase fair and reasonable.

BETHNAL GREEN.—The Electricity Committee announces that considerable progress has been made with the work of laying cables, &c., in the borough, and it is hoped to be in a position to supply electricity in the western portion of the district in the course of a few weeks.

HOSPITAL LIGHTING.—The Children's Committee of the Metropolitan Asylums Board has reported upon the defective condition of the electric lighting installation at the Children's Infirmary. The institution is partly lighted by electricity and partly by gas; the electric installation is in an extremely bad condition, and considerable overhauling will have to be carried out. The total cost of the work is estimated by the Board's engineer-in-chief at £215. The matter has been referred to the Works Committee to be dealt with.

SOUTHWARK.—In January last, the B.C. referred back to the Electricity Committee the accounts of the undertaking for the 12 months ended March 31st, 1915, with a view to its submitting proposals for obviating future loss, and for effecting economy in the working of the station. At the meeting of the B.C., last week, the Committee reported having inquired into the deficit of £6,410 on the year's working, which it attributed to the unprecedented conditions prevailing consequent on the war. The Committee is satisfied that the number of hands now engaged is at its minimum, and, so far as the general management and conduct of the station is concerned, it can, at present, see no grounds for recommending any alteration. The Committee expects to benefit next year from the recent revision and increased charges to consumers for light and power.

ST. MARYLEBONE.—The estimated revenue of the electricity undertaking for the year ending March, 1917, is as follows:—From sales of electricity to consumers, £180,975; from public lighting, £14,970; meter rents, £7,800; sale of fittings, &c., £10,285; rent of properties, plant on hire, and sundry charges, £4,765, making a total of £218,795. The estimated expenditure is, for generation and distribution costs, management expenses, rates, taxes, &c., £81,110; allowances to employés, £5,050; maintenance and repairs to public lamps and repairs to properties, £3,800; sales department, £9,955; repayment of loans, £47,440; interest, £68,507, making a total of £215,862, and leaving an estimated credit balance on the year's working of £2,933. During the new year a short-term loan will be liquidated, resulting in a reduction of £4,581 in interest and sinking fund charges.

Maidenhead.—PRICE INCREASE, &C.—The T.C. has decided to increase the price of current for lighting by ½d. per unit, and for power by 10 per cent. A long dispute with the Diesel Engine Co., Ltd., who claimed a sum of £365, has been settled by payment to the liquidator of £128.

Malton.—PRICE INCREASE.—The Northern Counties Electric Supply Co. has informed the Urban Council that from April 10th the charge for electricity supplied to the Council will be increased by 20 per cent. The company has agreed to consider an application by the Council for an abatement in the lighting contract for the past year owing to restricted lighting.

Manchester.—The Electricity Committee has given permission to the city electrical engineer (Mr. S. L. Pearce) to advise the boroughs of Rochdale, Chesterfield, and Stafford, on their respective electricity undertakings.

Mr. Ross Clyne has given notice of intention to move a resolution at this week's meeting of the City Council, regretting that a request made to the Electricity Committee for large supplies of current by a firm proposing to establish works in Manchester, was not brought before the Committee as a whole, for consideration as to possible ways and means to meet the demand in question. The resolution proceeds to urge that in future all proposals, offers, or requests of like importance shall be properly submitted to the discretion of the Committee before acceptance or refusal.

Navan (Co. Meath).—At a meeting of the Guardians, Mr. J. Kelly referred to what he regarded as the Urban Council's undue delay with regard to the electric lighting scheme. It was now some years, he said, since a provisional order was obtained, and if it was not put in force in a few months, it would lapse.

Newport (I. of W.).—PRICE INCREASE.—The Electric Light Co. has informed consumers that the price of energy for lighting will be increased by 15 per cent., and for power by 10 per cent. after the current quarter.

Northwich.—PRICE INCREASE.—The Northwich Electric Supply Co., Ltd., has given notice that in consequence of the increased cost of materials and labour, the charges for electricity will be increased 10 per cent. from July 1st.

Reigate.—Price Increase.—The T.C. has decided to increase by 15 per cent. the charges for lighting and power, and to raise the price for heating from 1d. to 1½d. per unit, plus 15 per cent., as from April 1st.

Salford.—Electric current is to be supplied free of charge to local hospitals under the control of the British Red Cross Society.

The Electricity Committee recommends the T.C. to authorise the cost of the proposed sub-station in the Greengate District to be defrayed out of moneys to be obtained from the sale of low-tension cables which will fall into disuse, the balance to be credited to capital account. The Committee proposes to enter into an agreement with the Peel-Conner Telephone Co., for the supply of energy for a period up to 10 years.

Stoke-on-Trent.—The T.C. has instructed the engineer to report as to the present plant in the power house, and upon what lines it is desirable that extensions shall be made, together with the probable cost.

Wirksworth.—Proposed E.L.—In reply to an inquiry from Mr. C. H. Best, of Bradford, as to the possibility of making preliminary arrangements for supplying the town with electric light and power, the U.D.C. has decided that it is undesirable to proceed with the matter at present.

Wimbledon.—Price Increase.—The T.C. has decided, as from April 1st, to increase the price of energy supplied in the borough, and at Merton and Maldens and Coombe by 10 per cent. A similar increase has been made for the hire of meters.

TRAMWAY and RAILWAY NOTES.

Dundee.—Year's Working.—The revenue from the Corporation tramways for the year shows an increase of £3,800, but the expenditure is greater by about the same amount.

Ilford.—Proposed Fare Revision.—In view of the increased running expenses, and the present prosperity of the town, the tramway manager has advised his Committee to consider the question of adopting the penny universal fare, and suggests that the scheme should be put into operation for the period of the war.

Leeds.—At a meeting of the City Council last week, Ald. C. H. Wilson (chairman of the Finance Committee) stated that the profits made on the tramway undertaking last year amounted to £91,000; £20,000 of this sum, however, represented money which would have been spent on track renewal but for the war, and £15,000 of it was to be put in reserve. He had anticipated that the profits from the tramways for the ensuing year would be £70,000, as against the Committee's estimate of £55,000, and if they could secure drivers for the cars there was little doubt that this year's figure would be exceeded at the end of the next 12 months, because, money being plentiful in the city, people would not walk.

Leicester.—Year's Working.—The total revenue of the tramway department for the year to December 31st last, was £188,520, as compared with £170,235 for the previous year. The working expenses, £122,142, increased by a less amount, leaving a gross balance of £66,733, as against £53,288 in 1914. After meeting interest, sinking fund charges, &c., and war allowances amounting to £7,412, the net balance remaining was £11,961, as against £11,221 in 1914, when war allowances were on a much smaller scale. It is recommended to appropriate £8,000 of the balance for rate relief, and £2,757 for reserve; the reserve fund in hand amounts to £92,797. During the year 40,440,158, being an increase of 2½ millions on the previous year, although the car-mileage, 3,899,939 miles, shows a reduction of 237,000 miles. The improved receipts were partly due to increased fares charged. At the end of the year 67 women conductors were employed on the cars.

Leyton.—The Tramways Committee recommends the carrying out of various repair, &c., works at the depôt, at a total cost of £160.

London.—The L.C.C. Housing Committee having proposed to make representations to the B. of T. on the inconvenience that would arise to the working classes from the closing of certain South London railway stations, the Highways Committee points out that the workmen's traffic at most of these stations is negligible, and that arrangements have been made by the tramway authorities to cope with any additional passengers resulting from the withdrawal of railway facilities.

Northampton.—The T.C. has been recommended to instruct the borough engineer to re-lay the curved tramway tracks in Mercer's Row and Abington Street.

U.S.A.—Extra-High-Pressure Turbines.—As previously mentioned in this journal, the Boston Elevated Railway has decided, in order to meet the growth of the load up to 1920, to install a 35,000-kw. steam turbine unit and to add 4,000-kw. rotary converters to its sub-station plant. The decision resulted from the relatively low first cost per kw. and superior economy of the large turbine over a 20,000-kw. unit which had been originally proposed. A feature of great interest is the decision to use a steam pressure of 600 lb., for which pressure future boiler plant will be built. The present South Boston plant operates on steam at 200 lb. pressure, and the new set will utilise the present boiler plant to commence with, being designed for the addition of probably six stages to the 16 stages considered necessary with the existing pressure. These extra stages will form either an extension of the turbine casing or a separate high-pressure section on the same shaft.

Regarding the use of high pressures, Messrs. Stone & Webster's engineers pointed out that the art of steam generation has reached a point where manufacturers consider it entirely practicable to build reliable equipment for operation at pressures ranging from 400 lb. to 600 lb., and that it seems probable that such equipment will be demanded by the best practice within a few years. The company cannot take advantage of these pressures yet, but the additional cost of a 35,000-kw. turbine designed for double the ordinary pressure is given as only about $15,000. The estimated saving of a 35,000-kw. unit over a 20,000-kw. unit, on a five-year period beginning 1917, using 200-lb. steam, based on 1,180,000,000 kw.-hours is $200,000, which covers the additional cost of the larger machine. The cost of adding the 35,000-kw. set, exclusive of engineering and fixed charges, will be $690,150, this including building, foundations, piping, exciter, ducts, an air-washer, switchgear, &c., as well as the turbine unit (which is figured at $315,000).

The South Boston station supplies 11 sub-stations, with 20 rotary converters, having an aggregate capacity of 41,000 kw. The 4,000-kw. rotary unit is to be adopted for future extensions in the central section of the city, since this not only reduces the cost and number of new sub-stations, but permits of the economical increase in capacity of existing sub-stations, whose 2,000-kw. machines can be used to advantage in the outlying districts.—*Elec. Railway Journal.*

Battery Car Operation.—The Cambridge and Indiana Railroad's 50-ft., 30-ton Edison battery car, during recent runs amounting to 738 miles, showed a total cost for platform labour and electric power, amounting to 13·9 cents per mile. Electrical energy cost $35·4 at 2 cents per kw.-hour. The company has just ordered another similar car, 35 ft. 8 in. long, equipped with 165 Edison A 10 cells and four Westinghouse motors.

TELEGRAPH and TELEPHONE NOTES.

Australia.—The Eastern and Associated Telegraph Companies will shortly open their own public office in Melbourne, Australia, which will be connected by special wire with their direct cable system.

Glasgow.—The special committee of the Corporation which deals with telephone affairs has recommended the T.C. to protest against the manner in which the charges for unlimited telephone service have been increased, without affording subscribers an opportunity to make representations against them, and to inform the P.M.G. that the Corporation reserves the right to take steps after the war, with a view to the modification of the charges and the amendment of the other conditions of service.

Norway.—At the end of June, 1914, the Government telegraphs and telephones possessed in the aggregate 220,443 km of wire and 22,674 km. of line; the bulk of the wire was installed for telephone subscribers' exchange connections, amounting to 129,690 km., while the trunk lines employed 67,713 km. The telephone system of Christiania claimed no less than 91,658 km. of wire, and the 72 State telephone exchanges had a total of 36,377 subscribers' stations. There were 104 million conversations during the year. Private telephone companies, numbering 330 in 1912, had 37,211 subscribers and transmitted 84 million messages, the revenue being over two million francs.—*Journal Télégraphique.*

Post Office Telegraphs and Telephones.—The report of the P.M.G. for 1914-15 was recently issued in the form of a blue-book. It states that the number of telegraph offices open at the end of March, 1915, was 14,222, an increase of 70; the number of telegrams handled was 91,179,000, an increase of over 4 millions, including over 3 million free Government telegrams more than in the previous year, and the receipts increased by £193,092 to £3,013,909. The military and naval traffic was extremely heavy, and Press telegrams increased by 6 per cent. The withdrawal of a large portion of the staff for military or naval service necessitated the employment of temporary staff, the training of additional operators, the recall of retired operators, and the use of the telephone in place of the Morse sounder at 7,350 sub-offices. The use of Creed high-speed printing telegraph machines set free a number of telegraphists, and a Western Electric multiplex was added on the London-Manchester route, on which the Murray instrument was already in use. Baudot working was extended, and the use of the Wheatstone was increased. The use of the telephone system for the dispatch and delivery of telegrams was found of great assistance, and the trunk telephone lines were also used for the delivery of urgent telegrams at night. The extended use of phantom telegraph circuits superposed on telephone trunk and junction circuits proved valuable. Foreign telegrams (apart from the cable companies' traffic) numbered 9,424,000, a decrease

of over two millions. At the outbreak of war there were 2,158 licences in existence for private wireless stations on land, an increase of 195; no fresh licences were issued, and the existing stations were dismantled. At the end of July, 1914, 942 merchant ships carried wireless apparatus under licence from the P.M.G., an increase of 63 during the four months; in that period 26,145 radiotelegrams were dealt with at the P.O. Coast stations.

The number of telephones owned by the Post Office (apart from military and naval telephones) was 749,565, besides 46,782 private-wire stations. Nearly 10,000 emergency circuits were provided specially for Government departments. The exchange telephones in London numbered 253,436. The number of effective calls during the year was 815 millions, a decrease of 2·3 per cent. New exchanges opened numbered 232, making the total 3,052. Trunk calls increased by 6·89 per cent., and 570 additional trunk circuits were provided, or 40,727 miles of wire. At 34 towns the separate trunk and local exchanges were amalgamated, with advantage, and new underground telephone cables have been laid and brought into use. An accelerated trunk service was introduced between Bradford and Leeds. Automatic exchanges were working satisfactorily at the G.P.O., Accrington, Chepstow, Darlington, Epsom, Hereford, and Newport, and similar exchanges were being installed at Blackburn, Dudley, Grimsby, Leeds, Paisley, and Portsmouth. Only 357 exchanges now do not give a continuous service. The number of rural party lines (farmers' lines) was increased by 849 to 2,265. Some 7¾ million telegrams were sent by telephone, an increase of 13·4 per cent.

The mileage of wire in use was 3,071,867 miles, an increase of 6·4 per cent; of the total, 265,765 miles were used for telegraphs and 2,806,102 for telephones. Aerial wires aggregated 997,292 miles, underground 2,060,918 miles, and submarine 13,657 miles.

Urgent demands for stores for military and naval purposes were dealt with on the outbreak of war; in one case material weighing over 100 tons was assembled and dispatched within 24 hours of the receipt of the demand. Some 16,000 telegraph and telephone instruments were issued for naval or military purposes during the year. The whole of the initial equipment for the base and field post-offices of the Expeditionary Force, weighing about 10 tons, was dispatched within two hours of the receipt of instructions. Owing to the rise in price of foreign timber, 44,000 British-grown poles were ordered.

The financial results of the working of the telegraphs and telephones were briefly as follows:—

	Revenue.	Increase.	Expenditure.	Increase.
Telegraph ...	£3,407,326	£286,813 ...	£4,656,607	£324,352
Telephone ...	6,481,827	290,643 ...	6,588,869	636,796

The telegraphs showed a net loss of £1,249,281, and the telephones a net loss of £107,042.

Part of the deficiency on the telegraphs was due to the use of the Continental cables for war purposes, and to an expenditure of £98,884 in wages to employés serving with the Colours. Similarly the telephone cables to the Continent had been used for war purposes, and £80,802 was paid in respect of telephone employés serving with the Colours.

Uruguay.—The Government has obtained statutory powers to take control of the telegraph, telephone, and post-office services, and will entirely reorganise them as soon as arrangements can be made to take them over from the present owners.—*T. and T. Age.*

Wireless Inventions.—It is reported that Senator Marconi has been engaged upon research work in Italy, and has obtained results which concern the future practice of the whole science of wireless telegraphy and telephony; patents are being applied for. The inventions will probably be applied at once in Italy to military purposes, and it is expected that by these means results heretofore impossible will be obtained.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney.—May 1st. Two 300-kw. turbo-alternators, condensers, switchboard, &c., for the pumping station at Ryde, for the Metropolitan Board of Water Supply and Sewerage at Sydney.*

May 3rd. N.S.W. Railways and Tramways Department. One 2,500-kw. turbo-alternator, for Zara Street, Newcastle, power house. Specifications (20s.) from the Engineer's office, 61, Hunter Street, Sydney.*

May 24th. N.S.W. Government Railways and Tramways. 16/600-volt d.c. motors for tramway stores, Randwick.*

Adelaide.—April 12th. P.M.G. Ten to eleven miles of lead-covered cable.*

Melbourne.—April 11th. City Council. 533,000 arc lamp carbons. See "Official Notices" March 25th.

April 18th. P.M.G. 8,500 fuses.*

April 26th. Victorian Government Railways. Car-lighting material—cables, switches, fuses, &c.*

May 1st. City Council. Meters and maximum demand indicators. See "Official Notices" to-day.

May 10th. Victorian Government Railways. Motor-generator set and accessories for battery-charging of baggage trucks.*

May 17th. Victorian Government Railways. One 2-ton electrically-operated goods elevator for Jolimont car-shed.*

Tamworth (N.S.W.).—May 1st. Additional generating plant, switchboard, mains, &c., in connection with the municipal electricity undertaking. Specifications from Mr. V. G. Kable, Town Clerk, Council Chambers.

Salford.—April 17th. Electricity Committee. Switchgear for 5,000-kw. sub-station equipment. See "Official Notices" to-day.

Walthamstow.—April 26th. U.D.C. Water-softening plant for the Electricity Department. See "Official Notices" to-day.

Warrington.—April 11th. Electricity and Tramway Committee. Motors and transformers. See "Official Notices" March 31st.

April 26th. Electricity and Tramways Committee. Boiler plant and economiser. See "Official Notices" to-day.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Barrow.—The T.C. has accepted the following contracts for electricity supplies for 12 months:—

Copper wire, &c.—A. F. Goodwin & Co.
Insulating compound and bitumen.—Dussek Bitumen Co.
Switches, &c.—General Electric Co., Ltd.
Joint-boxes and switch cut-outs.—B.I. & Helsby Cables, Ltd.
Electricity meters.—Chamberlain & Hookham, Ltd.
Prepayment meters.—Ferranti, Ltd.
Metallic-filament (Osram) and tantalum lamps.—Drake & Gorham, Ltd.
Carbon-filament lamps (Pope's).—Pope's Electric Lamp Co., Ltd.
Earthenware pipes and troughs.—Doulton & Co., Ltd.
Electric motors.—Veritys, Ltd.
Meter boards.—E. Cust.
Bricks.—Furness Brick & Tile Co., Ltd.
Engine and crank-chamber oils.—Vacuum Oil Co., Ltd.
Cylinder and turbine oils.—Jas. Light & Sons, Ltd.
Ash-elevating plant, £919.—The New Conveyor Co.
Oil-eliminating plant (additions), £105.—Paterson Engineering Co.

Newport.—Messrs. Chamberlain & Hookham, Ltd., have received a contract for meters for the coming year for Newport.

Bexhill-on-Sea.—T.C. 500 tons of Shipley or Tibshelf peas coal, for the electricity works: Myers, Rose & Co., £1 8s. 9d. per ton.

Bolton.—The following tenders have been accepted by the Electricity Committee:—

Bolton Brick Co.—Trough covers.
J. & F. Webster.—Casings, &c.

Derby.—T.C. Coal for the electricity works: Derby Coal Co., Ltd., Hill & Poyser, T. Walker, and Brookhouse, Johnson, Ltd.

Dudley.—The Lighting Committee recommends the Corporation to accept the tender of the Earl of Dudley for a 12 months' supply of steam coal, at 22s. per ton.

Halifax.—The T.C. has been recommended to purchase from the Brompton & Kensington Accessories Co., Ltd., the electric cooker now on approval at the electricity works, and to accept the following tenders:—

Edison Accumulators, Ltd.—A standard 2-ton Edison chassis, complete with electrical tip body, for removing ashes from the electricity works, for £977.
Daimler Co., Ltd.—Two 3-ton Daimler chassis, for the Tramways Committee, £1,488.

Ilford.—Messrs. E. Foster & Co. are to supply one truck weekly, over a period of six months, of Hawkins' nutty slack, at 20s. 6d. per ton, to the Electricity Committee.

Kingston-on-Thames.—The Committee proposes to seal contracts with W. Cory & Sons, Ltd., and Usher & Co., for the supply of 500 tons of Lambton coal at 37s. 6d. per ton, and 300 tons Shipley ½-in. slack, at 22s. 6d. per ton respectively.

Lancaster.—Corporation Electricity and Tramways Committee. Tenders accepted for four motor-buses: Edison Co. for the chassis, and Brush Co. for the bodies.

Leyton.—The tender of Messrs. Siemens Bros., Ltd., has been accepted by the U.D.C., at £172, for 2½ miles of service line cable (several sizes).

London.—The Metropolitan Water Board does not propose to enter into a periodical contract this year for the supply of electric lamps, wire, and accessories (sub-sections 1, 2 and 3). Instead, it has been suggested that the Works Committee should obtain tenders from time to time for the supply of such quantities as may be required during the period ending March 31st next.

The Metropolitan Asylums Board proposes to renew the contract with the Pritchett & Gold Co. for the maintenance of the electric battery at the Grove Hospital for a further period of five years, at £75 per annum.

L.C.C.—The Education Committee recommends that the chairman, vice-chairman and deputy-chairman of the Council, the chairman and vice-chairman of the Education Committee, and the chairman and vice-chairman of the Buildings Sub-Committee be authorised, during the Easter recess, 1916, to open the tenders received for installing electric light at the Southampton Street, Camberwell, L.C.C. school.

The Asylums and Deficiency Committee has accepted the following tenders for the supply of the under-mentioned stores for three months :—

Electrical sundries.—A. F. Goodwin & Co.; General Electric Co., Ltd.; Cox-Walkers, Ltd.; Edison & Swan U.E.L. Co., Ltd.; G. MacLellan and Co.
Electric lamps.—Pope's Electric Lamp Co., Ltd.

Manchester.—The Electricity Committee has approved the following firms as sub-contractors in connection with the tender of M. Louis Prat (Paris) for induced-draught plant :—

Chimney.—E. Danks & Co. (Duxbury), Ltd.
Electrical materials.—Lancashire Dynamo & Motor Co., Ltd.
Foundation base.—Galli Bros.

Midland Railway Co.—The recent reference to a contract for Osram lamps placed with the General Electric Co., Ltd., by the Midland Railway Co., was not intended to indicate that the contract for the exclusive supply of metal-filament lamps was given to that company. The order only covers a portion of the railway's requirements.

Morden.—Joint Hospital Board. Electric light maintenance (not including armature and field coil failures): D. J. Macdonald, Hounslow, £22 for the year.

Salford.—The Tramways Committee has accepted the tender of Messrs. Scholey & Co., Ltd., for steel tramway tires, amounting to approximately £1,055. The Electricity Committee has accepted the tender of Messrs. Babcock & Wilcox, Ltd., for two water-tube boilers, &c., for £11,544.

The following tenders have been accepted by the Tramways Committee for supplies :—

Car accessories (electrical), insulating materials, &c.—W. McGeoch & Co., Ltd.; W. T. Henley's Telegraph Works, Ltd.; General Electric Co., Ltd.; L. Andrew & Co.; British Westinghouse Co.; Micanite and Insulators, Ltd.; North British Rubber Co., Ltd.; Griffiths Bros., Ltd. (insulating varnishes); C. Macintosh & Co., Ltd.; B.I. & Helsby Cables, Ltd. (P. and B. tape); Siemens Bros. Dynamo Works, Ltd.; Le Carbone: H. Norbury & Co.; Gabriel & Co., Ltd.; W. Boydell and Sons, Ltd.; J. Hall.
Car accessories (mechanical).—W. J. Ritchie & Co.; National Rail and Tramway Appliances Co., Ltd.; J. Needham & Sons, Ltd.; Anti-Attrition Metal Co., Ltd.; Brown, Bayley's Steel Works, Ltd. (steel tires).
Ears, frogs, pull-offs, &c.—B.I. & Helsby Cables, Ltd.; Watlington & Co., Ltd.; J. Hall; British Westinghouse Co., Ltd. (lightning arresters).
Special car accessories.—British Westinghouse Co., list prices.
Wire, solder, lead and tin.—B.I. & Helsby Cables, Ltd.; L. Andrew & Co.; R. Johnson, Clapham & Morris, Ltd.

The following tenders have been accepted by the Electricity Committee :—

British Westinghouse Co.—Two 1,000-kw. rotary converters, £5,590.
General Electric Co., Ltd.—One 500-kw. rotary converter, £1,580.
Babcock & Wilcox, Ltd.—Two water-tube boilers, £11,544.

York.—T.C. Coal for the electric light works: Mr. G. Cooper (Bentley Colliery Co.), at 16s. per ton.

FORTHCOMING EVENTS.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, April 7th. At 7.30 p.m. At the Literary and Philosophical Society, Westgate Road, Newcastle. Address on "The Business Side of Science: Its Part in the Coming Economic Crisis," by Mr. T. C. Elder.

Royal Institution of Great Britain.—Saturdays, April 8th and 15th. At 3 p.m. At Albemarle Street, W. Lectures (V and VI) on "Radiations from Atoms and Electrons," by Prof. Sir J. J. Thomson.
Friday, April 14th. At 5.30 p.m. At Albemarle Street, W. Lecture on "The Genesis and Absorption of X-Rays," by Prof. Sir J. J. Thomson.

North of England Institute of Mining and Mechanical Engineers.—Saturday, April 8th. At 2 p.m. At the Wood Memorial Hall, Newcastle-on-Tyne. General meeting.

Salford Technical and Engineering Association.—Saturday, April 8th. At 7 p.m. At Royal Technical Institute. Lecture on "British Design Modern Cylindrical Grinding Machines, External and Internal," by Mr. T. R. Shaw.

Junior Institution of Engineers (Midland Section).—Tuesday, April 11th. At 7.30 p.m. At the Imperial Hotel, Temple Street, Birmingham. Paper on "Application of Chain Gear for Power Transmission," by Mr. C. Turtle.

Association of Engineers-in-Charge.—Wednesday, April 12th. At St. Bride's Institute, E.C. At 7.30 p.m. Paper on "Steam Turbines," by Mr. G. Stoney.

Dynamicables' Anniversary Meeting and Dinner.—Wednesday, April 12th. At 7.30 p.m. At the Trocadero Restaurant. Mr. C. P. Sparks in the chair.

Liverpool Engineering Society.—Wednesday, April 12th. At the Royal Institution, Colquitt Street. Paper on "Electric Power in Quarry Operation," by Mr. G. K. Paton.

Institution of Electrical Engineers.—Thursday, April 13th. At 8 p.m. At Victoria Embankment, W.C. Discussion on "The Present Position of Electricity Supply in the United Kingdom, and the steps to be taken to Improve and Strengthen it."

(Newcastle Local Section).—Monday, April 10th. At 7.30 p.m. At the Mining Institute. Paper on "The Nature of Electrical Insulation," by Mr. W. M. Thornton.

(Scottish Local Section).—Tuesday, April 11th. At 8 p.m. At 207, Bath Street, Glasgow. Paper on "Branches from E.H.T. Circuits," by Mr. D. M. MacLeod.

(Yorkshire Local Section).—Wednesday, April 12th. At 7 p.m. At the Philosophical Hall, Leeds. Paper on "Electric Heating: Its Present Position and Future Developments," by Mr. G. Wilkinson.

Leeds Association of Engineers.—Thursday, April 13th. At 7.30 p.m. At 5, Park Lane. Annual meeting.

Institution of Mechanical Engineers.—Friday, April 14th. At 6 p.m. At the Institution of Civil Engineers, Great George Street, S.W. General meeting.

NOTES.

Easter Holidays.—Owing to the Easter Holidays, the Electrical Review for Friday, April 21st, will be published on Wednesday, April 19th. All matter for both the editorial and advertisement pages for that issue should be in our hands at the earliest possible moment. A notice regarding the latest times for advertisements to be received, appears in our advertisement pages to-day.

Lost Time.—In the Belfast Munitions Court, two young electricians named Robert Sanderson and James Mawhirk were charged with absenting themselves from work. It was stated that during the nine weeks from January 20th to March 22nd, Sanderson lost 34 per cent. of his time and Mawhirk 33 per cent. Sanderson, who did not appear, was fined 40s., and Mawhirk 20s.

Electrical Output of U.S. Power Stations.—A table published in the *Electrical World* gives statistics relating to the output, load factor, &c., of the 36 largest electrical generating systems of the United States, which produce about 70 per cent. of the aggregate output of the country. The combined output of these companies in 1915 was 13,000 million kw.-hours, of which about two-thirds was generated by water-power. The Commonwealth Edison Co. produced 1,198 million units, with a load factor of 42·5 per cent. for the year. The Niagara Falls Power Co. produced 899 millions, with a load factor of 81·28 per cent., and three other companies exceeded 725 millions. The Hydraulic Power Co., which produced 695 millions, recorded the remarkable load factor of 91 per cent., the bulk of the energy being used in electro-chemical industries. Only two of the companies had an output of less than 100 million units.

London and Frankfort Metal Interests.—It is stated on good authority that, with the consent of the German and English Governments, a dissolution is to take place of the relations hitherto existing between the Metall Bank und Metallurgische Gesellschaft and the Metall Gesellschaft of Frankfort-on-Main, on the one hand, and Henry R. Merton & Co., Ltd., of London, on the other, in the sense that both sides will completely dispose of their mutual shareholdings. Certain formalities with English executors have to be settled before the transaction can be definitely completed. In this connection it is mentioned that of the ordinary shares in the London company the sum of £150,000 was in the possession of the Metall Bank and £180,000 in that of the Metall Gesellschaft, these having been disposed of in London, together with shares for £20,000 which were in private ownership. In return large blocks of shares in the Metall Gesellschaft, the Metall Bank and the Schweizerische Gesellschaft fur Metallwerke have been sold in Germany out of the holdings of persons who are closely associated with the firm of Henry Merton & Co. The sale price of the latter has ranged from 200 per cent. to 270 per cent. It is added that the incentive to the dissolution of relationship emanated from London.

I.M.E.A. Annual Meeting.—The 21st annual general and business meetings of the Municipal Electrical Association will be held at the Institution of Electrical Engineers, London (as headquarters), on June 22nd and 23rd next. The first day's proceedings include the reading of the presidential address by Mr. Alex. C. Cramb, Croydon, this year's president, followed by the reading and discussion of three papers as follows :—

"Boiler House Design," by Mr. W. W. Lackie, Glasgow.
"Area of Supply from an Economic Standpoint," by Mr. H. S. Ellis, South Shields.
"The Application of Electric Power to Agriculture," by Mr. W. T. Kerr, Hereford.

The second day's proceedings will be confined to the morning, when the annual business meeting will be held. No special arrangements will be made in regard to hotel accommodation or travelling facilities. The secretary is Mr. C. McArthur Butler, 28, Bedford Square, W.C., to whom communications should be addressed.

Petrograd Electricity Plans.—The Petrograd Town Council has appointed a special committee for establishing a basis for buying back the electrical concerns of the capital. The committee is working under the chairmanship of Town Councillor A. A. Voronoff, and is preparing a general plan for uniting various electrical concerns, having in view their reconstruction and further exploitation. It is also preparing an estimate and system of charges for current, and so on. It is said that the committee promises that electricity shall be much cheaper for the consumers than it was before. The estimated cost of the operations of the committee, which it is hoped will be closed in the year 1918, is about 548,000 roubles.

Tungsten Deposits in Burmah.—According to the *Mining and Engineering World*, the first serious attempts to develop the Wolfram deposits of the Indian Empire and Lower Burmah occurred about 5 years ago. During 1909-13 Lower Burmah produced over 5,000 tons of concentrates valued at nearly £400,000, and the present rate of production is about 2,000 tons. The methods adopted in mining are extremely primitive; open quarries, hand crushing of the ore are usual; the labourers are largely Chinese and Telegus. It is now announced that the Indian Government is taking energetic steps to stimulate the output.

Inquiries.—Firms that stamp out steriliser bodies are inquired for; also makers of paper rolls for recording voltmeters and makers of an assaying apparatus, using an electric current to deposit the metal under test.

Institution and Lecture Notes.—Institution of Electrical Engineers.—The Committee of the Birmingham Local Section has had under very careful consideration the question of alien enemy membership, which is at present before the Institution, and, after a full discussion of the matter at two meetings, unanimously passed the following resolutions for transmission to the Council of the Institution :—

1. That the Council be requested to obtain powers to amend the Articles of Association to exclude from membership of the Institution any undesirable aliens or undesirable members of alien origin.

2. That, in view of the foregoing resolution, it is not considered necessary to proceed with the resolutions at present before the Institution.

The Committee has prepared the following list of officers to act during the Session 1916-17 :—

Chairman.—Col. J. F. Lister, R.E.

Vice-Chairmen.—S. T. Allen, N. B. Rosher.

Present Ordinary Members of Committee (remaining in office).—H. Foulds, C. C. Garrard, Ph.D., S. H. Holden, W. A. Jackson, Prof. G. Kapp, D.Eng., W. Marden, A. Pearson, B.A., W. E. Sumpner, D.Sc., F. Thursfield, J. M. Walshe.

Ordinary Members of Committee (new nominations).—*F. H. Clough, T. Plummer, E. O. Turner.*

Hon. Secretary.—J. D. Morgan.

The Committee's nominations are given in italics.

Additional nominations must reach the Hon. Secretary, at 13, Temple Street, not later than April 12th.

The annual general meeting of the Manchester Local Section was held on Tuesday last. The chairman (Mr. B. Welbourn) presided, and there was a good attendance of members.

The ballot for the election of chairman, hon. secretary, and Committee for the next session resulted as follows :—

Chairman.—Mr. A. E. McKenzie.

Vice-chairman.—Messrs. C. J. Beaver and A. P. M. Fleming.

Committee.—Profs. Field and Miles Walker, Dr. Cramp, Messrs. H. Allcock, A. G. Livesay, S. L. Pearce, J. S. Peck, H. A. Ratcliff, J. A. Robertson, H. D. Symonds, S. J. Watson, and Alderman Walker.

At the close of the meeting a lecture on "Recent Researches in X-Rays" was given by Prof. E. Rutherford, of the Manchester University.

The report states that the number of members at the close of the Session was 735, a slight increase over the figures for last year. The attendance has averaged slightly over 100 per meeting, which would be a good figure for ordinary times, and under present conditions must be considered exceptionally good. In the discussions upon the various papers, a very high general level has been attained, and an unusual number of new speakers has taken part.

Royal Institution.—The Day Lectures after Easter include the following :—Prof. T. M. Lowry, two lectures, "Optical Research and Chemical Progress"; Prof. W. H. Bragg, two lectures on X-Rays and Crystals : (1) "New Methods of Research"; (2) "First Results and their Applications" (the Tyndall Lectures); Prof. H. S. Foxwell, two lectures, "The Finance of the Great War : New Problems and New Solutions"; "How we Stand To-day, and What Lies Ahead." The Friday evening discourses will be resumed on May 5th, and will include the following :—Sir James Mackenzie Davidson, "Electrical Methods in Surgical Advance"; Prof. Charles G. Barkla, "X-Rays."

Junior Institution of Engineers.—The meeting at which a paper on "Speeding-up," by Mr. R. Rankin, is to be read, has been postponed from the 10th to the 18th April.

In an address before the Dublin Rotary Club, Sir John Griffith, late engineer to the Dublin Port and Docks Board, suggested the extension of the electrical equipment of the Port for the rapid discharge of vessels.

Fire Prevention.—The British Fire Prevention Committee's fire warnings, which have been issued since the outbreak of war, cover a number of matters that require the attention of the public with the object of reducing the ordinary fire waste and meeting the air raid danger. The public are advised to apply for the particular class of notice or warning that they desire. These are provided gratuitously. The warning for factories and works engaged on Government contracts is No. 16. For the air-raid danger, warnings Nos. 17A and 18A should be obtained. No warning notice is issued to any caller at the Committee's offices or testing-station, or upon any telephone message. Application must be made in writing, with a large stamped and addressed envelope enclosed for the reply, to the Registrar, The British Fire Prevention Committee, 8, Waterloo Place, London, S.W., and both the nature of the notice and the reference number of the warning (as given above) must be given.

Nickel-Chromium Patents in the U.S.A.—A list of the licensees under the Marsh patent, No. 811,859, for the use of nickel-chromium wire as a resistance element in electric heating apparatus, was published in the *Electrical World* of March 4th. The patent is owned by the Hoskins Manufacturing Co. and the General Electric Co.—the parties in the recent infringement case, reported in our issue of July 30th, 1915, in which the latter company was the loser. The General Electric Co. has acquired a third interest in the patent. An advance in the prices of heating appliances is anticipated. The owners do not intend to take proceedings against firms that have used infringing devices in the past, provided that they deal with the owners or their licensees in future, and do not deal in infringing devices. The Driver-Harris Wire Co., who manufacture nichrome wire, are in conference with the owners of the patent.

Fatalities.—At Failsworth last Friday an inquest was held into the death of Edward Capewell (48), who, together with another man, was employed at the works of Messrs. Ferranti, Ltd., Hollinwood. They were lifting a carboy of nitric acid from a trolley on to the floor when it burst and the liquid ran on to some brass castings and fired. Despite medical aid Capewell died later. The foreman, who was still suffering from the effects of the fumes, would not be able to attend the inquiry for some days. The inquest was adjourned.

An Openshaw electrical engineer, Arthur Fletcher, aged 45, employed at the Armstrong, Whitworth works was knocked down by a Manchester Corporation tramcar last week and killed. Verdict : "Accidental death."

Electrical Instrument Makers Wanted. — The Wireless Section of the Corps of Royal Engineers is open to recruit first-class instrument (electrical) makers. Conditions as to pay, terms of service, &c, can be obtained by application to Major A. Handley, R.E., St. Martin's Gate, Worcester. Applicants should state fully their training and experience, and say if they are eligible for service.

Volunteer Notes.—Engineering Institutions' V.E.C.—Orders for week commencing April 10th, 1916.—By Lieut.-Col. Clay, V.D., Commanding.

Monday, April 10th.—Sections 1 and 2, Technical; Sections 3 and 4, Squad and Platoon, Signalling Class and Recruits.

Tuesday, April 11th.—School of Arms, 6 to 7 p.m.

Thursday, April 13th.—Shooting for Sections 3 and 4.

Friday, April 14th.—Sections 3 and 4, Technical; Sections 1 and 2, Squad and Platoon, Signalling Class and Recruits.

Saturday, April 15th.—Adjutant's Instruction Class at 2.30 p.m.

E. G. Fleming,
Company Commander and Acting Adjutant.

3rd Batt. (Old Boys) Central London Volunteer Regiment.—Battalion Orders by Capt. R. J. C. Eastwood (Commandant), Thursday, April 6th, 1916 :—

Battalion Parades.—Saturday.—The Battalion will Parade outside Baker Street Station at 2.30 p.m., and proceed by train to Wembley Park, for Battalion Drill, under the Commandant.

Sunday.—The Battalion will Parade at Liverpool Street Station (low level entrance, G.E.R.), at 9.30 a.m., and proceed by train for Entrenching duties.

Musketry.—There will be shooting at Bisley on Saturday next, 8th inst., and all day Sunday, 9th inst. Members proceeding to Bisley on Saturday, must Parade, in uniform, at 12.45 p.m., No. 6 Platform, Waterloo Station, and members going down on Sunday, at 9.45 a.m., No. 6 Platform.

The Acton Range will be open on Saturday, 8th inst., at 2 p.m.

Names (for both Ranges) must be forwarded to the Musketry Staff by first post Saturday morning.

A. G. Joiner, *Major and Adjutant*, O.B.C.

The Electrification of Fibres.—Arrangements are being made for setting on foot a thorough scientific investigation into the question of the electrification of fibres in the textile industry, a phenomenon which has given a great deal of trouble to manufacturers. The Textile Institute, at the instance of the Mill Managers' Association, has requested the Leeds University to take the research in hand, the cost being borne by the Institute, with the assistance of the manufacturers.

Registration of Firms.—With reference to the subject of our leading article of last week, we regret to state that in the House of Commons, last Friday, Mr. Lloyd George, in reply to Mr. Annan Bryce, said that as there was reason to believe that the Registration of Firms Bill would not be accepted as a non-contentious measure, the Government was not, as at present advised, prepared to proceed with the Bill in the Commons.

Electric Light Switching.—At the end of this month the results of the competition just closed will be published in this journal. Meanwhile, we are asked by Messrs. A. P. Lundberg and Sons to announce the fact that, owing to the success of this competition, a supplementary examination will be conducted shortly on the same sets of problems. Particulars will be issued to old and intending new competitors early this month. Those who have a copy of the February Examination Pamphlet should keep it by them ; those who have not, can obtain one on application within the next three weeks.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station and Tramway Officials.—The L.C.C. Highways Committee recommends that, during the absence through illness of the chief officer of tramways, the deputy chief officer of tramways, Mr. J. K. Bruce, shall take the place of Mr. A.

L. C. Fell as one of the representatives of the Council on the Rolling Stock and the Permanent Way and Building Conciliation Boards.

The Ilford Electricity Committee proposes to increase the salary of Mr. R. F. Windett, meter superintendent, to £145 a year.

On the occasion of his marriage with Miss H. Moon, Mr. Thos. Law, of the Rotherham Corporation Tramway staff, has been presented by the shed staff with a timepiece.

Coventry T.C. has adopted a recommendation of the Tramways Committee increasing the salary of the engineer and manager, Mr. T. R. Whitehead, from £500 to £600 per annum.

Certain rearrangements of the staff of the mains department of the Manchester Electricity Department have been made in consequence of the ill-health of Mr. L. R. Lee, mains engineer, and the Electricity Committee has decided to recommend the following increases of salaries:—Mr. J. Clarke, from £250 to £275 per annum; Mr. H. Hawkins, from £250 to £275 per annum; Mr. F. T. Fowler from £200 to £210; and Mr. A. J. Lovell from £185 to £200. The total advances amount to £75, which is the amount the mains engineer will relinquish from his salary of £475 per annum.

General.—Mr. C. J. Spencer, manager of the Bradford City Tramways, has been appointed Vice-Chairman of the Lord Mayor's Citizens' Contribution Committee, which is charged with the important duty of systematising the collection of funds from all classes of citizens in Bradford for the replenishment of the Lord Mayor's War Relief Fund. Mr. H. Moss, electrician, of Bradford, is on the same Committee as the representative of the local electrical engineers, together with Mr. Thos. Roles, the Bradford city electrical engineer.

Mr. William Wood, the senior partner in the firm of Scupham & Wood, Ltd., timber merchants and makers of electric blocks, Leeds, has just completed 60 years of service at the works. The local Press has interviewed Mr. Wood in connection with the celebration, and in the course of the article it is mentioned that some years ago Mr. Wood and his sons prepared to meet the demand for electric switch blocks, bell pushes, and casings, laying down a special plant therefor, with the result that when war broke out they were in a position to secure a good deal of the German trade. Mr. Wood expresses the opinion that the Germans will never get it back.

London Gazette notice.—Territorial Force, Royal Engineers, Tyne Electrical Engineers:—Second-Lieutenant H. G. White to be temporary captain; Second-Lieutenant (temporary Captain) H. G. White is seconded.

With reference to a notice which appeared in this column in our issue of March 10th regarding the arrangement existing between Mr. C. H. Best and Mr. Chas. Pullan, of Bradford, Mr. Pullan writes to say that, so far as the date mentioned is concerned, the announcement is premature. "Certain differences have arisen between Mr. Best and myself, but so far no definite dissolution of the existing arrangement between us has been signed. I would add that it is my intention to continue with village electric supply schemes in the future."

We regret that in our report last week of the speech delivered by Lord Vaux of Harrowden, at the Electrical Trades' Benevolent Institution annual meeting, reference was made to the death of Mr. E. G. Byng. This, of course, was an error, and should have read Mr. H. G. Byng.

Mr. W. B. Shirehampton, who was manager of the export department of Messrs. Veritys, Ltd., for many years, is shortly proceeding to Russia in the interests of a few electrical firms, and would be glad to hear from others who are interested in the development of this important market now and after the war. He will be in the country for several weeks. Further particulars may be obtained from Mr. Shirehampton at 75, Curtain Road, E.C.

Roll of Honour.—The death has occurred, at the Royal Infirmary, Aberdeen, of Private William Warner, of the 1st Battalion Gordon Highlanders, who was wounded in November, 1914, during severe fighting in the Ypres region. Prior to the war he was engaged at the Keighley Corporation electricity works.

Private F. Appleton, of the Buffs (East Kent Regiment), who has died of wounds received in action, was for seven years prior to the war engaged on the staff of the Isle of Thanet Tramway Co., Ltd.

Rifleman Alfred Dudley Tidey, of the Queen's Westminster Rifles, who has died after an operation at St. Mary's Cottage Hospital, Hampton, was, prior to his enlistment in August, 1914, engaged with the Pall Mall & St. James' Electric Light Co.

Rifleman F. Poe, of the Rifle Brigade, who was, prior to his enlistment, with the British Thomson-Houston Co., Ltd., of Rugby, is now reported killed in action. He had been missing since July 30th last, after a liquid fire attack at Hooge.

Private Frank Lynas, Royal Inniskilling Fusiliers, killed in action, was a Reserve man, and, prior to the war, was employed in the Belfast Corporation's electricity works.

Obituary.—Mr. T. Richards.—The death occurred last week of Mr. Thomas Richards, chairman of the Cleveland, Portishead & District Electric Supply Co., Ltd.

NEW COMPANIES REGISTERED.

Conner Magneto and Ignition, Ltd. (143,456).—Registered March 30th, by F. Samuelson, Midland Bank Chambers, 71a, Queen Victoria Street, E.C. Capital, £52,000 in 50,000 pref. shares of £1 each and 40,000 ord. shares of 1s. each. Objects: To adopt agreements (*a*) with the Peel-Conner Telephone Works, Ltd., of 71a, Queen Victoria Street, E.C.; (*b*) with M. S. Conner relating to management; and (*c*) with M. S. Conner whereby certain shares are to be allotted to him for the consideration referred to therein, to carry on the business of proprietors and manufacturers of and dealers in aeroplanes, motors, motor and other carriages, vans, wagons, and other vehicles, all kinds of cycles and parts and accessories thereof, especially magnetos and other ignition apparatus, and electric lighting and starting appliances, carpenters, joiners, electricians, mechanical engineers, machinists, rubber manufacturers and merchants, dealers in mineral oils, motive power, traction, light and heat, instructors in motor traction, motor repairers and experts, &c. The subscribers (with one preference share each) are: F. Samuelson, 71a, Queen Victoria Street, E.C., solicitor; R. C. M. Poulter, 71a, Queen Victoria Street, E.C., solicitor. Private company. The first directors (to number not less than three or more than nine) are H. Hirst, 67, Queen Victoria Street, E.C.; J. Fraser, 31, Copthall Avenue, E.C.; and M. S. Conner (managing director), Peel Works, Adelphi, Salford. Qualification, 100 shares. Remuneration (except managing director) as fixed by the company. Registered office: Midland Bank Chambers, 71a, Queen Victoria Street, E.C.

Phonopore Construction Co., Ltd. (143,445).—This company was registered on March 29th, with a capital of £4,175 in 4,000 ordinary shares of £1 each and 3,500 founders' shares of 1s. each, to carry on the business of manufacturers of military telephonic and phonoporic instruments, munitions, and all articles used in the manufacture thereof or used in connection with warfare on land or sea, engineers, founders, &c., and to adopt an agreement with Justus Eck. The subscribers (with one share each) are: H. J. Eck, 10, Priory Road, Chiswick, W., engineer; T. H. Oswald, 5, Budge Row, E.C., engineer. Private company. The number of directors is not to be less than five or more than nine. Justus Eck shall be one of the first, and shall hold office permanently subject to holding 1,500 founders' shares. The New Phonopore Telephone Co., Ltd., shall be entitled during the continuance of a lease referred to in an agreement dated January 7th, 1916, between the company and Justus Eck, to be represented on the board by two directors; other directors to be appointed by the subscribers. Qualification of ordinary directors, £50. Remuneration as fixed by the company (£200 per annum extra for the chairman). Justus Eck is chairman. Registered office: 53-57, Park Street, Southwark, S.E.

Walter Robb, Ltd. (143,493).—This company was registered on March 31st, with a capital of £10,000 in £1 shares (9,000 "A" and 1,000 "B"), to take over the business of an electrical engineer carried on by Walter Robb at Wakefield, Yorks. The subscribers (with one "A" share each) are: W. Robb, 11, Drury Lane, Wakefield, electrical engineer; H. F. Buttenshaw, Walton, near Wakefield, electrical engineer. Private company. The number of directors is not to be less than two or more than three: the first are W. Robb (permanent) and H. F. Buttenshaw (with £416 and £208 per annum respectively as remuneration). Qualification, £500. Solicitor: J. Charlesworth, Wakefield. Registered by Jordan & Sons, Ltd., 116-17, Chancery Lane, W.C.

Associated Engineers, Ltd. (143,474).—This company was registered on March 31st, with a capital of £1,000 in £1 shares, to carry on the business of electrical, motor, and general engineers, founders, machinery and part manufacturers, &c. The subscribers (with one share each) are: J. Rhodes, 153, Manningham Lane, Bradford, automobile engineer; J. R. Pepper, Moorhead Lane, Shipley, automobile engineer. Private company. The number of directors is not to be less than two or more than seven; the first are J. Rhodes, J. R. Pepper, and three others to be appointed by the subscribers. Qualification, 10 ordinary shares. Solicitor: W. Dunn. Secretary: A. E. Stringer. Registered office: Manor Row Chambers, 97, Manor Row, Bradford.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Banbury and District Electric Supply Co., Ltd.—A memorandum of satisfaction in full on February 5th, 1916, of debenture dated March 26th, 1913, securing £100, has been filed.

Orford Electric Light and Power Co., Ltd.—Issue on December 10th, 1912, of £20, and on March 17th, 1916, of £130, debentures, parts of a series of which particulars have already been filed.

Ramsden Green, Ltd.—Issue on March 21st, 1916, of £235 debentures, part of a series of which particulars have already been filed.

Isle of Thanet Electric Tramways and Lighting Co., Ltd.—Agreement, dated March 16th, 1916, to secure £1,000, and any sums which may become payable under a joint and several promissory note for £3,000, charged on the company's undertaking and property, present and future. Holder: Lord Arthur Butler, 7, Portman Square, W.

Runbaken Magneto Co., Ltd.—Particulars of £1,000 debentures, created February 11th, 1916, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Lancashire Motor and Engineering Co., Ltd.—Mortgage dated March 6th, 1916, to secure £1,700, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: J. Craig and G. H. Wood, Mosley Street, Manchester.

CITY NOTES.

French Tramway Companies.

The gross receipts of the *Tramways de Bordeaux* reached £242,000 in 1915, as compared with £254,000 in the previous twelve months, and the net profits were £51,000 and £57,000 in the two years respectively. It is intended to pay a dividend of 8s. per share, as against 9s. in 1914.

The gross receipts of the *Compagnie des Tramways de Nice et du Littoral* declined from £170,000 in 1914 to £126,000 last year, and the gross profits from £49,000 to £36,000. As the net profits only amount to £3,700, it is not proposed to make any distribution, and dividends were also not paid either in 1913 or 1914.

The Société des Tramways d'Amiens proposes to distribute £1 per share for 1915, as contrasted with 16s. in 1914, and £1 in 1913; the Société Versaillaise de Tramways Electriques et de Distribution d'Energié, £1 2s. per ordinary share for 1915, as in the previous year; the Tramways de Toulon, 7s. 2½d. per share, or 9 per cent., for 1915; and the Tramways du Var et du Gard, 7s. 2½d. per share, as in 1914.

The Compagnie Parisienne de Tramways earned £316,000 in 1915, as compared with £347,000 in the previous year, but after deducting working expenses and financial charges the net profits only amount to £8,000, as against £25,000 in 1914. The financial charges include £16,000 for the settlement of litigious accounts and £28,000 for the improvement of the permanent way and rolling stock, whereas the amount provided under the latter heading was only £17,000 in 1914 and £12,000 in 1913. It is not proposed to pay any dividend for the past year, as was also the case in 1914, but to place most of the balance to a special fund, and to carry a small sum forward.

The Société des Tramways de Rouen, where great activity prevails in connection with the traffic with England, experienced a recovery in 1915 from the fluctuations in the receipts and profits which occurred in the preceding year. The directors state that it was possible to provide a new workshop staff in place of the men called up for service and to resume the maintenance and repair of the rolling stock, which had to be neglected in the later months of 1914. The gross receipts were the largest on record, and the net profits amounted to £45,000, as contrasted with £42,000 and £48,000 in the two previous years respectively. A dividend at the rate of £1 4s. per share has been declared, this comparing with £1 and £1 6s. 4d. in 1914 and 1913 respectively.

British Westinghouse Electric and Manufacturing Co., Ltd.

The net profit for 1915 was £176,752, plus £8,121 brought forward, making £184,873. There is written off patents, goodwill, &c., £25,000; special depreciation of plant, machinery, &c., £35,241; additional reserve for employers' liability, £5,000; dividend of 7½ per cent. on the preference shares, £75,000; carrying forward, £44,632. There have been charged against revenue the usual expenses for maintenance of works, plant, &c., and in addition there has been applied to depreciation of the same items £87,150, which includes the special sum stated above (£35,241) to cover abnormal wear and tear of plant due to war conditions. Having regard to possible liabilities for taxation of excess profits under the Finance and Munitions of War Acts, it has been thought desirable to carry forward a much larger sum than usual. Last year the directors referred to the acquisition of certain controlling interests in the French Westinghouse Co., and they are glad to say that the business of that company shows signs of improvement. Annual meeting: April 6th.

Brompton and Kensington Electricity Supply Co., Ltd.

At the annual meeting, on Monday, the Chairman (Mr. H. R. Beeton), said that his anticipation that the year 1915 would be even less satisfactory than 1914 had, unfortunately, been fulfilled. Although their output had more than doubled in the past 13 years, their profits for last year were the lowest for any year in that period, and it had only been after considerable discussion, and some difference of opinion, that the Board had recommended the payment of the usual dividend of 10 per cent. The justification for such a course was to be sought in the fact that they had husbanded their resources in more prosperous years, so that to-day they had more than half of their capital represented by mains, with reserves of profits amounting to upwards of 60 per cent. of their capital invested in the business, with no debenture debt, and with 15 years of their tenure still to run. But, although they had restricted themselves to 10 per cent. dividend when it would sometimes have been possible to pay more, they could not, of course, maintain this rate if the scale of profits were to remain permanently at its present level. The present condition of things was mainly due to public restriction and private economy in lighting, and to increased cost of production consequent upon the war. Although a profitable return on the capital invested in the Accessories Co. with a view to encouraging the use of electricity for heating and cooking had been further postponed owing to the war, it was largely due to such expenditure that in their purely residential area they had virtually maintained their output in spite of restriction in lighting. The new turbo-generator, when installed, would give considerable economy in working to compensate them in some measure for increased cost of coal. Although the emergency legislation for limitation of price had tended to amelioration, they had not so far realised the full benefit promised under the Act, chiefly owing to disorganisation in production and shortage in transportation. The matter was, however, receiving the attention of a Committee of the Gas and Electricity Companies in conjunction with the Departments of Admiralty and Munitions, and it was hoped that some amendment would ensue. Although the progress of the Accessories Co. had been retarded by the war, its capital account had not been extended, and its revenue results showed an improvement, which was likely to grow. The Restaurant, which continued to serve as an excellent advertisement as well as an experimental laboratory, now enjoyed a custom which, in spite of the increased price of food, made it self-supporting. The show-room sales had been prejudiced by the prevailing shallowness of the public purse, and the stove department, whilst furnishing some important cooking installations, had been largely diverted to the production of munitions. The experience of the first three months of this year led him to conclude that the results of the present year would not be substantially worse than those of the past year, and if the coal position, which was undoubtedly precarious, was not aggravated, they might be rather better.

W. T. Glover and Co., Ltd.

Trading during 1915 resulted in a credit balance of £54,438, and £7,950 was brought forward. The following are deducted:—Directors' remuneration, &c., £1,035; 4½ per cent. interest on first mortgage debenture stock, £4,250; 5 per cent. interest on second mortgage debenture stock, £3,642; written off investments, £5,949; appropriation for payment to trustees of second mortgage debenture stock, £4,000; 5 per cent. preference dividend, £4,333; transfer to first mortgage debenture redemption fund, £2,500; dividend of 5 per cent., less income-tax, on ordinary shares, £4,977; transfer to reserve fund, £20,000; leaving £11,701 to be carried forward subject to payment of excess profit duty. With the above appropriations the redemption fund for the first mortgage debenture stock will stand at £40,500, that for the second ditto at £36,000, and the reserve fund at £50,000, making a total of £126,500. It will be appreciated that to provide the increased working capital to meet the present conditions, it is necessary to materially strengthen the company's reserves. During the year the works have been, and still are, largely engaged on the manufacture of cables, wires, &c., directly or indirectly for the prosecution of the war. Nine acres of land have been purchased for the general development of the company's business, which of late years has suffered by the works being greatly congested. A portion of this land is thought to be in excess of the company's probable requirements, and it is proposed to sell such portion to the Trafford Power & Light Supply (1902), Ltd., in whose welfare the company is largely interested. The directors ask for full power to transact business from time to time with that company, notwithstanding that they, or some of them, may be directors of that company. Annual meeting: April 10th.

The Berlin Elevated and Underground Railway.

The report for 1915 of the *Gesellschaft fur Elektrische Hoch und Untergrund Bahnen* states that a large decline in the passenger traffic occurred in the seven months ended with July, as compared with the equivalent period in the previous peace year, but a not inconsiderable increase took place in August and September, which had also continued into 1916. During the year the total number of passengers carried amounted to 69,542,277, as against 77,027,513 in 1914, and the expansion in the last five months was 4,352,000 in excess of the corresponding term in 1914. The working results were influenced by the large advances in wages and the cost of materials, and further reductions in the customary employés were caused through men being called to the Army, which, however, it was possible substantially to equalise by the engagement of women. The train mileage run was 2,123,476, as contrasted with 2,698,404 miles in 1914; the daily average number of persons carried was 190,527, and the average receipts per passenger amounted to 1.52d., as against 1.54d. in the preceding year. The accounts show the following figures:—

	1914.	1915.
Ordinary share capital	£2,600,000	£2,600,000
Preference shares	500,000	500,000
Loans	3,994,000	3,988,000
Gross receipts	418,000	394,000
Net profits	190,000	168,000
Dividend percentage on ord. shares	4½	4
Carried forward	31,000	17,000

The report states that work on the line from the "triangle" to the Nollendorf Platz and Wittenberg Platz was continued as far as the circumstances permitted.

Woking Electric Supply Co., Ltd.

The total revenue for 1915 was £20,331, and the working expenses were £10,649, leaving £9,681, plus £653 brought forward and £124 income-tax accumulations. The interest on debenture stock absorbs £2,514, interest on temporary loans £289, 6 per cent. preference dividend £2,999, and there is put to depreciation and renewals fund £1,750, £900 to reserve, 5 per cent. is paid on the ordinary shares, and £693 is being carried forward. The number of consumers increased from 2,021 to 2,101, and the lamps connected from 95,803 to 106,360, the net revenue advancing from £18,878 to £20,331. During 1915 there were issued £580 4½ per cent. debenture stock and £245 ordinary shares. Owing to the continuous growth of the business, issues of further debenture stock and ordinary shares were necessary. The annual meeting was held on March 25th.

Urban Electric Supply Co., Ltd.—The gross profit for 1915 was £68,513, as against £68,962 for 1914. The available balance is £21,889, out of which £12,500 is required for preference dividend and £9,389 is carried to reserve for depreciation.

W. T. Henley's Telegraph Works Co., Ltd.

Mr. S. Gedge presided at the annual meeting on March 29th. He said that out of £10,000 set aside last year to provide for the dependents of the company's employés with the Forces, £4,333 had been spent, and he hoped that the balance would suffice for the purpose intended. The company had made a larger profit than in the previous year. They had not been able to accept all the private orders which they had been offered, but he hoped that they would not eventually lose those customers. They recommended a dividend and bonus of 25 per cent. for the year, or 5 per cent. more than was paid in the previous year. The company was excellently managed. The profit was about £41,000 more than that of the previous year. Ample provision had been made also for any claim which might be made in connection with the excess profits tax. They had over £139,000 in War Loan and other trustee securities at cost, less a reserve of £10,000. He had visited the works recently, both at Woolwich and Gravesend, and had seen the great improvements which had taken place during the year. At Woolwich they had suffered considerably from lack of space, and Mr. Hatton deserved great praise for the way in which he had overcome difficulties and had been able to meet requirements. At Gravesend they were in a different position, inasmuch as they had 12 acres to deal with, and could put up exactly what was required. Their workshops there were finer than any in the country, and they had now completed very fine dining-rooms for the workpeople with separate accommodation for both men and women, and these were lighted and heated by electricity, whilst they also cooked by electricity. Then, again, near by, in Union Street, they had opened a large warehouse for the purpose of their tire business. The Blomfield Street premises had been extended by taking in adjoining buildings, as the staff there now consisted of some 240 people. The Managing Director, Mr. George Sutton, M.I.E.E., who seconded the adoption of the report, said that the extraordinary course of events of the war had been reflected in their business. In addition to their special activities, other features of the year were the reduction in the demand, and their inability to meet the demand that did exist, for cables for the home and colonial commercial trade, and the greatly increased demand from neutral countries. As regarded the home trade and the reduction in the demand for cables for commercial purposes, there had been a great falling off in the usual home and colonial demand for wire and cables apart from cables required in connection with the war. Shareholders might think that they were also losing goodwill. He did not, however, think that they would do so. They would not suffer the loss of their orders because of inability to execute them through working in the national interests. In regard to the increased demand from neutral countries, to some extent that was due to the closing down of the German supply. In Germany and abroad, but not much in England, they had a great competitor. He thought that on the whole outside the British Colonies they had a larger trade in cables than English manufacturers, and therefore the closing down of the German trade had increased the demand on English manufacturers. The demand, however, had been very difficult to meet in consequence of the uncertainty of obtaining licences for export from the Government, and although they were able to locate their consignees, so that they knew that their cables would not find their way into an enemy country, there were no doubt other reasons which necessitated the stoppage of exports to neutral countries. They endeavoured not to commence the manufacture of cables until they had reasonable grounds to suppose that they would be able to dispatch them. The increase in the profit was due particularly to two causes. First, there was the strong financial position of the company. When the war started their position and credit were at a very high standard, and they used them, and continued to use them, to buy as freely as desirable those materials which were essential to meet the demand for their products which they expected would be upon them. Copper, rubber, and lead were the principal essentials, and their large forward purchases of these materials, which had risen so much in value, had brought considerable profits, as they had been made into cables, which were sold on the price of raw materials at the time the cables were ordered. There was, of course, another side to the picture. When raw materials fell in value, they were bound to be carrying a stock, more or less large, which involved them in a loss when sold in the form of cable. That was a contingency they always had with them, although it was now greater than usual, but the nature of their business necessitated always purchasing certain materials some months ahead of requirements, and their accounts always made provision, by means of contingent reserves, for the eventuality of loss on stocks. The second cause of the increased profit was increased turnover. They had added considerably to their plant in order to enable them to meet the demands which were made upon them, and owing to the uncertainty of their getting deliveries of small sizes of copper wire which they did not make, and which was required for urgent cables, they acquired for a cash payment a small factory in Yorkshire. The motor tire factory was more than paying its way. He could see the possibilities of an industry being built up there that might become as large as the electrical side. In regard to trade after the war, they did not know what the demand for their products would be, but they knew that the capacity for making insulated wires and cables in this country had enormously increased owing to the war demand. As they had put down new plant, they might be assured that other cable makers had done likewise, and there would be a severe struggle for the business to be had, which would probably mean the cutting of prices. They hoped that that might be avoided for the good of the industry generally, but with more machinery in the country than could be employed, it looked as though they might have a difficult time in front of them. They were not afraid, however, that Henley's would be unable to meet the position, for they possessed three first essentials of success—money, skill, and good organisation; and as they had successfully weathered storms in the past, they might look forward to the future with equanimity.

Madras Electric Tramways (1904), Ltd.

Mr. A. M. Quill, presiding at the annual meeting last week, said that for the first seven months of 1915 the traffic receipts were 6 per cent. less than for the corresponding period of 1914. During the last five months there was such a marked improvement in traffic that for the whole year there was an increase of 6.4 per cent. in traffic receipts and an increase in net receipts, and an advance of 5 per cent. in passengers carried. The special renewals of permanent way, which had been in hand for some years, had been practically completed. It was very satisfactory to be able to recommend an increase in the ordinary dividend. Recently a resolution was passed by the Madras Corporation praying the Government to increase the track rent paid by the company. If this petition were granted it would be a breach of faith. The fares were as low as in any part of the world, and much lower than they were entitled to charge under their Government Orders. The dividend on the shares could not be regarded as extravagant (5 per cent.), particularly as the average return since the company was incorporated was only 3.3 per cent. With regard to the negotiations with the Government regarding various extensions, referred to a year ago, the routes were approved by the Corporation and submitted to the Government for confirmation, but they still awaited the latter's decision.

City of London Electric Lighting Co., Ltd.

Mr. F. W. Reynolds, presiding at the annual meeting on March 22nd, said that Mr. Braithwaite, the chairman, was in America on very urgent business. The Marquess of Winchester was on active service. The capital expended during 1915 was about half the usual amount, and in 1916 it would be still less, as they were reducing expenditure in all directions. There was no object in giving a detailed comparison of revenue and working expenses, as in such abnormal times it could be of no real value. Everything that could be done to produce economical working was being done, and they hoped that there would be some limit to the rise in prices, which was so seriously affecting their business. Their chief difficulty was in regard to coal, the price of which was now 100 per cent. more than before the war, chiefly by reason of increased shipping rates, and supplies had at times been exceedingly difficult to obtain. For 1915, coal cost £14,000 more than for 1914, an increase of 40 per cent. There was no prospect of early relief, indeed, they must expect another and still larger increase during 1916. They were no believers in the policy of raising prices in such times as these until they had actually felt the effect of the increased cost of production and could claim that the time had come to ask consumers to take a further share of the burden. Both last year and this year shareholders had submitted voluntarily to a reduction of their income, before increasing the price of electricity. They had just given public notice of their intention to increase the price of electricity by 10 per cent. after the end of March. The balance for the year was about £16,000 less than last year. They were distributing £11,000 less in dividends, and providing the balance of £5,000 by reducing the carry-forward to £18,000. It had been pointed out at previous meetings that their liberal carry-forward constituted a dividend equalisation fund, and the present was a time when they might rightly draw upon that fund. The company had 168 members of its staff with the Forces; 4 had been killed and 9 wounded. None of their staff were pecuniary losers by going to the Front; all cases were carefully attended to by the managing directors, Mr. Bailey and Mr. Bull.

British Aluminium Co., Ltd.

Mr. A. W. Tait presided at the annual meeting last Friday. He said that the trading profits for the year, after making the provision for excess profits duty and adding interest and dividends on investments and deposits and the revenue derived from estates and transfer fees, was £312,546, an increase of £40,291. These results were the best which the company had shown since its incorporation in 1894. The conditions were, however, absolutely abnormal, and entirely due to the exceptional demand. He could not give particulars of the uses to which the metal was at present being put, and it was useless to speculate as to the probable conditions which would rule as regards the demand for the metal after the war. The recent uses and developments would go a long way to make up for any falling off there might be in the ordinary demand, due to the unavoidable and necessary period of recuperation required by all countries involved in the war. Further, there was no doubt that the experience gained during this war would open up a demand in certain directions in the future, which would considerably broaden the uses and applications of the metal.

The sales had been approximately the same as those of the previous year, and this was accounted for not by any slackening in the demand, but owing to a shortage in the anticipated production, due to abnormal weather conditions in the West of Scotland and in Norway during the summer of last year. Prices for the metal showed substantial advances during the year; but these advances occurred particularly during the last six months, and as it had always been the practice to cover the requirements of their regular customers at fixed prices for the whole year, the average which was obtained was considerably below current prices at the end of the year. The costs of production had been very materially affected during the year, owing to the heavy increases in labour charges and the cost of raw materials, freights, insurances, and other expenses. Great difficulties had been experienced in obtaining the necessary supplies of raw materials and coal required by the various works, the principal difficulty being not so much the supply of the actual material as the obtaining of the necessary freighting facilities. The difficulties with regard to the supply of raw materials and labour and freight would undoubtedly exist until the termination of the war, and, in consequence, the costs of production were showing, and would continue to show, very material increases. The various works of the company had been fully employed during the year, and the additional plant for the manufacture of carbon electrodes was completed and put into operation before the close of the year. The erection of the new alumina works, which should have been completed by this time, had made slow progress, entirely due to the shortage of labour and materials, and it would be some months yet before those works could be put in operation. No further development work had been carried out on the Orsières power scheme, nor was this possible until after the war. The Martigny-Orsières Railway continued in operation for general traffic, but it did not contribute anything to their revenue. The depreciation reserve account had been increased to £250,000 by the appropriation of £50,000 from the profits of the year, and the reserve account had also been brought up to the same sum by the appropriation of £70,000 from the profits of the year. The necessity for making ample provision for reserves had been accentuated by the abnormal conditions, and it was advisable that their position should be strengthened, in order that they might be able to meet the peculiar and difficult times which would arise at the termination of the war, when ordinary commercial business had to be resumed in the markets of the world. Their competitors in neutral countries had naturally been considerably strengthening their position during these abnormal times, and, as their resources had not been depleted by the heavy taxation which was falling upon British industry, they would be in a position, if necessary or desirable, to create keen competition in international markets and also in the home market, unless some measure of protection was given by the Government. The results submitted were undoubtedly satisfactory, and amply justified the policy of the gradual building up of reserves which had been one of the main principles adopted by the present board of directors since the reorganisation of the company six years ago, and, looking back over those six years, the progress which the company had made in the time, and the position which it had established for itself, both commercially and financially, were good. However, this company, like all industrial enterprises, must be subject to the usual fluctuations which were the law of industry, and it was therefore incumbent upon the directors to see that the position of the company was strengthened, so that it could not only meet the demands of the extension of its activities, but that it might be able to live through any period of temporary depression with comparative equanimity.

Cleveland and Durham Electric Power, Ltd.

Mr. J. Falconer, M.P., presided at the annual meeting on Friday last. He said that the gross profits showed a decrease of £5,681, but that figure, owing to the exceptional way in which the company had been adversely affected by the war, did not afford any indication of the development of the business. If they took the business of the three combined companies, which was the only sound method of ascertaining what the true result of the business had been, for the years 1913-14-15, they found that the gross revenue had been as follows:—£131,933 in 1913, £141,482 in 1914, and £151,512 in 1915, increases of £10,000 in each of the two years since 1913, the pre-war year. In their case, differing from the experience of other of their companies, the result had been a serious diminution in the value of business done without any corresponding diminution of the amount of plant required to meet the demand. In all the mining districts—coal and iron alike—the output had been greatly reduced owing to the absence of men at the war. This had been further accentuated by the fact that in other businesses, such as the cement business, which they supplied, there had been substantial reductions in the demand for material produced. There had been practically no increase in the demand for current for the manufacture of munitions. The company's revenue had increased by £20,000/in the three years 1913-14-15; that was the natural development of the business. On the other hand, they had been seriously hit by the war in the matter of the cost of production. The figures for the past three years were:—1913, £91,839; 1914, £95,914; and 1915, £110,368. That increased cost was due to two causes. In the first place, the amount of current which they had generated in their waste heat stations had been seriously reduced by the fact that hematite iron had been largely substituted for Cleveland iron, and the result had been that the gases available for the waste heat stations had been much reduced. In 1915 the volume of energy delivered to them from waste heat stations had been reduced by about 15 million units as compared with the previous year. The consequence was that the energy they had supplied had come from the coal-fired plant at Grangetown. Thus, the coal bill was greatly enlarged, while prices had been very much in excess of those obtaining in normal times. In 1913 their coal bill was £845, whereas in 1915 it was £16,404, an increase of something over £15,000. This increase had had a serious effect upon their cost, and would continue to have an effect during the war. They must take this element into account in judging the trade condition of their business. The war had revealed to them the extraordinary value of the waste heat arrangement they had made. If the current had not been supplied to them through the waste heat stations it would have been impossible for the company to have lived through the period it had passed through, because it could not have paid for the coal (in the absence of waste heat stations) required for the consumers. They had never had to increase their night load, which would have given them additional revenue, nor had they been in a position to ask for increased prices. Their policy had been, in order to ensure financial stability, to have long-term agreements with their consumers, a policy which, he believed, was thoroughly sound for a company that had not a large reserve of capital behind it. In consequence of this, they had been compelled during the war to supply their consumers at the same prices as in normal times, notwithstanding that their costs had increased. It was, therefore, impossible for them to compare their conditions with those of other companies. They had for some time been satisfied that it was imperative, in order to obtain a fair return for their current, that they should stand out for a higher price, and they had also decided that their future policy should be to insist upon having a graduated scale of prices varying according to the price of coal. After the report had been seconded, Mr. A. Gemmell said that the halting and lame apology which the chairman had made was not satisfactory. It was not much consolation to hear that waste heat had failed them when they required it most, and when coal was dear. He suggested that there should be a Government inquiry into the position of the company. The report was adopted.

Liverpool District Lighting Co., Ltd.

At the annual meeting, held last week, the Chairman referred to the death of one director and the resignation of another, and added that Mr. Bromley Holmes, formerly city electrical engineer of Liverpool, had been appointed to the board. The accounts showed that they had done better than they expected. Restriction of lighting had caused a loss of 40,000 units and £850 revenue, but they had obtained Government contracts resulting in the sale of 108,000 units, so that the net increase was 68,000, the largest they had experienced, though, of course, they could not obtain the same price for large Government contracts as from other consumers. The result was a net increase of income of £168, but the increased cost of fuel, &c., was £560, leaving a net reduction of £392 in working profit. Fuel had further risen, and would affect the 1916 figures. To counteract this, they had followed the lead of the Liverpool Corporation and had increased their charges by 12½ per cent. all round. They were considering the question of coal storage, so as to provide for further reserves of fuel. The dividend for the year was 4 per cent.

Bell Telephone Co. of Canada.—The accounts for 1915 show gross earnings of $9,634,673, as compared with $9,599,026, and after deducting all charges, including $2,170,000 (against $2,010,000) for depreciation, the net revenue totalled $1,663,848, which compares with $1,650,837. The usual dividend of 8 per cent. has been paid, leaving a surplus of $223,848, increasing the total surplus to $1,249,139.—*Financial News.*

Falkirk and District Tramways Co., Ltd.—The *Financial News* states that the accounts to October 16th show an available sum, including £674 brought in, of £5,813. After providing for depreciation, &c., the directors declare a dividend of 6 per cent. for the year, as compared with 5 per cent. for each of the two preceding years, carrying forward £726.

Calcutta Electric Supply Corporation, Ltd.—The units sold to consumers during the four weeks ended February 25th were 1,362,833, compared with 990,763 in the corresponding four weeks of 1915.

STOCKS AND SHARES.

Tuesday Evening.

The Budget is out this Tuesday night, and the secrets which the Chancellor of the Exchequer has kept with commendable closeness now stand revealed to the expectant taxpayer. These mysteries exercised a slightly numbing effect upon investment business before they were made known, but

had little influence upon prices, this being traceable more in the sentiment which prevailed than in quotations themselves. The Home Railway market has given way in the absence of further support coming forward to assist the buying movement of a fortnight ago. Once the Budget proposals are digested, investment business will return to the House, because there is literally any amount of money about; and the provinces, prospering like the proverbial bay tree, although for a different reason, send the bulk of their capital to London when they wish to employ it in Stock Exchange channels.

Amongst the electric lighting shares which went ex dividend last Friday are both classes of City of London and County of London shares. Metropolitans are again ⅛ up on the week, thanks, of course, to the expectation of what the new committee may be able to do by way of suggestion with a view to restoring the company to some, at least, of its past success. It is worth noticing that City and County preference have both returned to their par value of £10, at which the yield is 6 per cent. on the money. St. James' are ⅛ better, and the market as a whole shows firmness, due to a little inquiry for several of the best-class shares, and the discovery of the buyers that there are very few shareholders who wish to realise at the present time and prices.

Underground Electric income bonds have again risen 1½ to 83, being picked up by investors in the provinces who realise the attractions of a security upon which the interest is paid free of taxation when that tax is something to be seriously taken into account.

In which connection, may we observe that, with the income-tax fluctuating as it is at the present time—for even the latest proposals may not prove the limit of the burden which the war will impose in this way—it seems advisable to abandon our previous practice of estimating the yield with allowance for the tax, in those cases where dividends are paid free. Accordingly, we have reverted to the previous practice of working out all the returns on a "flat" scale, but have indicated by an asterisk those stocks and shares the dividends upon which are distributed free of tax. It requires but a simple calculation for the person interested to make this allowance according to the amount of income-tax current when he is working out the return.

Districts have gone back to 16¾, shedding most of their previous week's rise, but Metropolitans and Central Londons are steady. Tube railways stand to benefit from Zeppelin scares; and the ill-wind which brings the raiders may possibly profit proprietors of tube stocks.

The feature in telegraph markets is the further rise in the price of Marconis. A month ago the shares stood below 2, and to-day they are at 7s. 6d. higher, the reason for the improvement being the expectations of the amount which the Government is thought likely to pay the company for the use of its system since war broke out. Another bull point is the announcement that Senatore Marconi has invented a new development in wireless telegraphy, which bids fair to be of great importance, and which will be made public as soon as the formalities in connection with patent rights are concluded. American Marconis have hardened to 16s., and Canadians to 8s., the cheerful optimist maintaining that the latter will certainly go to 10s. before long.

Both the Globe Telegraph shares are ex dividend, but have recovered the deduction in each case. Eastern ordinary rose a point. The Anglo-American Telegraph stocks are a little lower.

The report of the British Westinghouse Co. did not entirely dissipate the disappointment felt with the retention of the dividend at 7½ per cent., and the price of the shares is dullish at 2. Electric Constructions at 15s. are a shade better. Telegraph Constructions rose 10s. to 34½. Manufacturing issues are good as a whole, such shares as Henleys, Callenders, British Insulated, and India-Rubber being more readily sold than bought, except when they come to market in connection with a deceased account.

The activity in rubber shares has died down in consequence of the interruption to communication with the provinces caused by the gale of last week. The lines are being mended, but even as late as this (Tuesday) evening, telegraphic and telephonic communications with the country outside London are erratic and uncertain. There is not much doing in copper shares. Prices of the popular companies move rather aimlessly, and business is of a meagre character.

Various of the American light and power shares have risen sharply during the past few days. Alabama Traction, Light and Power common gained 3 points at 24, and the bonds put on 2 at 67. Mississippi River Power shares advanced 4 to 20, and this group is in demand from people on the other side of the Atlantic. They, on their part, cannot sell shares here, in consequence of the physical possession restrictions imposed by the Treasury, so, as their transactions must all be purchases so far as London is concerned, the market moves only one way when there is anything doing in it on account of New York. Brazil Tractions, too, are better at 54½; and there has been a sensational rise in the shares of the City Services Co. Mexican issues are harder in tone; the only quotable alteration is a rise of 3 points—making 6 within the past fortnight—in the Tramway Co.'s 5 per cent. bonds.

SHARE LIST OF ELECTRICAL COMPANIES.

Home Electricity Companies.

	Dividend 1914.	Dividend 1915.	Price April 4, 1916.	Rise or fall this week.	Yield p.c.
Brompton Ordinary	10	10	7	—	£7 2 10
Charing Cross Ordinary	5	5	8½	—	7 13 10
do. do. do. 4½ Pref.	4½	4½	8¼	—	6 18 6
Chelsea	5	4	8⅛	—	5 14 4
City of London	9	8	11⅝ xd	—	6 17 9
do. do. 6 per cent. Pref.	6	6	10 xd	—	6 0 0
County of London	7	7	1'⅛ xd	—	6 18 3
do. 6 per cent. Pref.	6	6	10 xd	—	6 0 0
Kensington Ordinary	9	7	5½	—	6 13 4
London Electric	4	3	1	—	9 0 0
do. do. 6 per cent. Pref.	6	6	4½	—	7 5 5
Metropolitan	8½	3	1⅛ xd	+ ⅛	6 * 4
do. 4½ per cent. Pref.	4½	4½	8	—	7 10 0
St. James' and Pall Mall	10	8	5⅞	+ ⅛	6 16 2
South London	5	5	2⅞	— ⅛	8 13 10
South Metropolitan Pref.	7	7	1⅛	—	6 14 0
Westminster Ordinary	9	7	5½	—	6 13 9

Telegraphs and Telephones.

	Dividend, 1914.			
Anglo-Am. Tel. Pref.	6	93½	— ½	6 1 10
do. Def.	33/6	21½	— ⅜	7 19 3
Chile Telephone	8	6⅜	—	6 5 6
Cuba Sub. Ord.	5	7⅞	—	6 9 0
Eastern Extension	7	12⅜	—	*5 9 10
Eastern Tel. Ord.	7	129	—	*5 8 6
Globe Tel. and T. Ord.	6	10⅜ xd	+2/-	*5 15 8
do. Pref.	6	10 xd	+3/-	6 0 0
Great Northern Tel.	22	34½	—	6 7 6
Indo-European	13	50	—	6 10 0
Marconi	5	2 11/16	+ 3/16	4 5 6
New York Tel. 4½	4½	100⅜	—	4 9 4
Oriental Telephone Ord.	10	1⅝	—	5 14 3
United R. Plate Tel.	8	5⅞	—	*7 19 0
West India and Pan.	1	1 1/16	—	9 10 6
Western Telegraph	7	12¼	—	*5 8 9

Home Rails.

Central London, Ord. Assented	4	67½	—	5 18 6
Metropolitan	1½	23½	—	4 5 0
do. District	Nil	16¾	— ⅜	Nil
Underground Electric Ordinary	Nil	1 1/16	—	Nil
do. do. "A"	Nil	5/6	—	Nil
do. do. Income	6	83	+1½	*7 4 7

Foreign Trams, &c.

Adelaide Sup. 6 per cent. Pref.	6	4⅞	—	6 3 1
Anglo-Arg. Trams, First Pref.	5½	3⅞	—	7 6 8
do. 2nd Pref.	5½	8⅜	—	8 3 0
do. 5 Deb.	5	78	—	6 8 2
Brazil Tractions	4	54½	+1½	6 8 5
Bombay Electric Pref.	6	10½	—	5 17 3
British Columbia Elec. Rly. Pfce.	5	53	—	9 8 8
do. do. Preferred	—	38	—	Nil
do. do. Deferred	—	34	—	Nil
do. do. Deb.	4½	61¼ xd	—	6 18 3
Mexico Trams 5 per cent. Bonds	—	41	+3	Nil
do. 6 per cent. Bonds	—	85	—	Nil
Mexican Light Common	Nil	20	—	Nil
do. Pref.	Nil	32	—	Nil
do. 1st Bonds	—	33	—	—

Manufacturing Companies.

Babcock & Wilcox	14	23	—	6 1 8
British Aluminium Ord.	5	23/4	—	4 5 0
British Insulated Ord.	15	10⅜ xd	—	7 4 7
British Westinghouse Pref.	7½	2	—	7 10 0
Callenders	15	11½	—	6 10 6
do. 5 Pref.	5	4⅝	—	5 17 8
Castner-Kellner	20	3⅛	—	6 8 0
Edison & Swan, £8 paid	Nil	7/-	—	Nil
do. do. fully paid	Nil	1½	—	Nil
do. do. 5 per cent. Deb.	5	57 xd	—	8 15 8
Electric Construction	6	15/-	+3d.	6 0 0
Gen. Elec. Pref.	6	9⅛	—	6 8 1
Henley	20	14⅜	—	*6 15 7
do. 4½ Pref.	4½	4	—	5 12 6
India-Rubber	10	9½	—	*10 10 6
Telegraph Con.	20	34½	+ ½	*6 19 10

* Dividends paid free of income-tax.

Browett, Lindley and Co., Ltd.—According to the *Financial Times* the report for 1915 shows, after deducting £1,907 for interest, writing off £6,316 for depreciation, and making provision for tax and duty, a net profit of £14,010, to be deducted from the debit, which will then stand at £7,696. The directors submit a scheme for readjustment of capital.

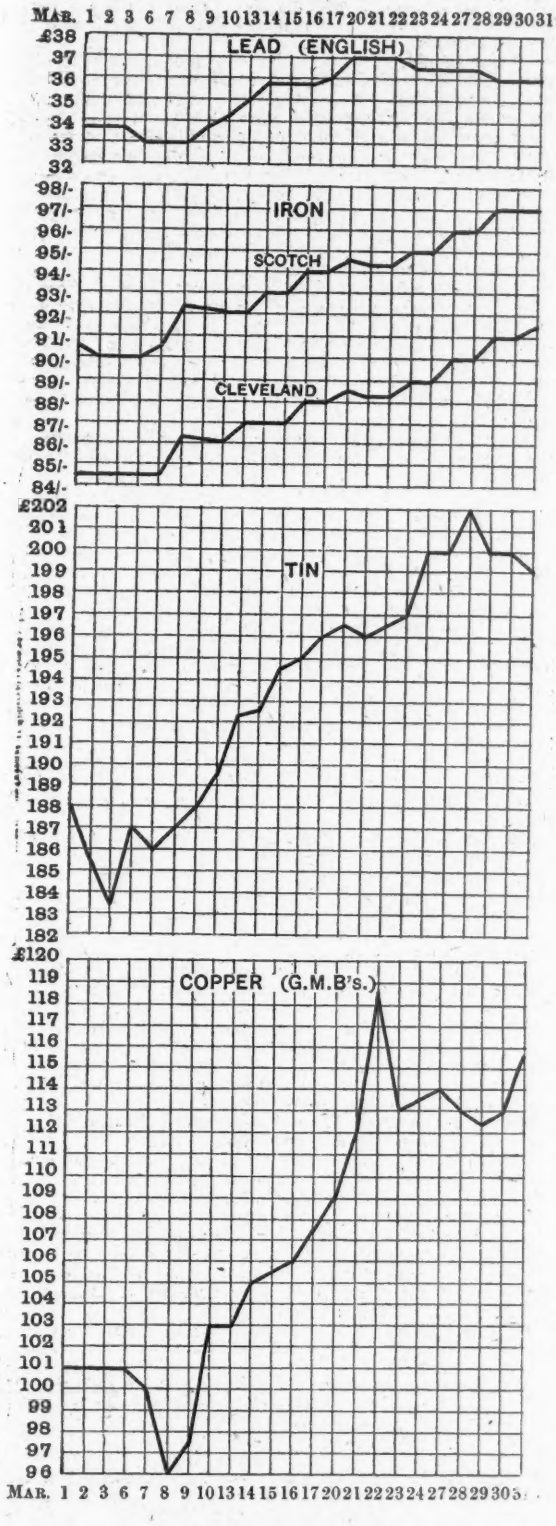
Oldham, Ashton and Hyde Electric Tramway Co., Ltd.—The report for 1915 states (says the *Financial Times*) that the revenue amounts to £34,823 (£33,398 in 1914), and the expenditure (including £1,600 for debenture interest and £1,500 placed to provision for renewals account) amounts to £25,062 (compared with £26,024 in 1914), leaving a net profit of £9,761 (compared with £7,374), which, plus £1,021 brought forward, makes £10,782. The directors propose to place to reserve fund £3,000, to pay a dividend at the rate of 6 per cent. per annum on the ordinary shares, and to carry forward £2,282.

Marconi Wireless Telegraph Co. of America.—The gross earnings for 1915 were £141,000, against £150,600 in 1914; other income £21,000, against £30,000. £22,400 is placed to reserve, as compared with £24,400, carrying £35,400 forward, as against £29,800.

Shawinigan Water and Power Co.—A dividend at the rate of 1¾ per cent. for the quarter ended March 31st upon the common stock is announced.

METAL MARKET.

Fluctuations in March.



Electrolytic Gas for Lighting and Heating.—In a recent issue of *Elettrotecnica*, Carlo Velardi advocates the use of hydrogen gas, obtained by electrolysis, for lighting and heating, in substitution for, or mixed with, coal gas. The difficulties attending its use, the chief of which is its distribution, are easily surmounted, while the advantages from its employment, especially in a country like Italy, abounding in hydro-electric energy, are great. Its utilisation for heating and cooking purposes, he contends, is easier of realisation than the replacement of coal gas by electricity.

THE HIRE AND MAINTENANCE OF CONTINUOUS-CURRENT MOTORS.

By HENRY JOSEPH, A.M.I.E.E.

(*Abstract of paper read before* The Institution of Electrical Engineers *at Leeds, March 8th*, 1916.)

The electricity-supply undertaking of which the author has charge supplies continuous current, principally for textile driving, in the town of Hawick, in Roxburghshire.

Table I shows the proportion of motors on hire at the end of 1914 in mills and for various industrial purposes.

TABLE I.

	No. of motors.	Total H.P.	Average H.P.
Consumers' own motors ...	162	966	6.0
Motors on hire-purchase ...	9	445	49.5
Motors on hire	105	643	6.1
Totals	276	2,054	7.5

Practically the whole of the above motors are maintained by the author's staff; and most of those owned by the consumers have been supplied through the company and the drive arranged under their supervision. Table II gives the present rates of hire for some of the sizes.

TABLE II.

H.P.	Quarterly rental. £ s. d.	H.P.	Quarterly rental. £ s. d.
¼	0 9 0	.....	
1	1 0 0	..... 20	4 5 0
5	2 5 0	..... 50	6 5 0

The hire rate includes the motor complete with pulley, starter, main switch, cut-outs, shunt regulator, and slide rails, if these are required, all fixed and connected up. The hirer pays for belting and the cost of mains from the service (or from the nearest available point of supply) to the motor and starter. The result is that practically the whole of the material is returnable on dismantling, and only the cost of labour is lost.

The rental covers the cost of all maintenance and renewals. New brushes are fitted when required, and no question as to whether the company is liable ever arises in the event of a breakdown. Damage occasionally occurs as the result of carelessness or negligence on the part of the hirer's employés, but it has not been considered good policy to raise the question of liability in such cases. They do not often occur, and the inconvenience caused to the user by a breakdown is quite sufficient incentive as a rule for him to urge his employés to treat the motor carefully.

It is to this policy, coupled with prompt attention to repairs, that the success of the hire system is largely due. Consequently consumers are quite willing to pay in most cases rentals which are admittedly high in comparison with the purchase price of the motors.

The company safeguards itself against loss due to a motor being hired for a short period and then returned, by inserting a clause in the hire agreement by which the hirer undertakes to pay an agreed sum to cover the cost of installation and removal in the event of a motor being returned before the expiration of a stated period.

Nearly all the hosiery mills, among them some of the largest in Scotland, hire their motors. They prefer to confine their attention to their business and to hand over the whole responsibility of their electric drive to the supply company.

Consumers possessing their own motors are encouraged to insure them against breakdown. In the event of a minor breakdown, a man is promptly on the spot to carry out repairs on site if possible. If the trouble cannot be quickly remedied another motor is fixed as quickly as possible. For mill work these are important considerations.

Since 1902 the average horse-power has increased from 3.2 to 6.1 H.P., and the capital cost has diminished from £14 to £6 per H.P. There has been a gradual increase in the percentage cost of maintenance due to the ageing of the bulk of the motors; this figure will probably settle down to an average of about 6 per cent. on the capital cost.

During the last five years the gross rentals amounted to about 18 per cent. of the capital outlay (about 25 per cent. is the average rental obtained on the total cost with new motors during this period), and the net rental was about 12 per cent., part of which is allocated to revenue and the balance set aside to a redemption fund for writing down the value of the motors when returned from hire.

About 27 motors are kept in stock, 40 starters, 12 shunt regulators, and 60 pulleys, besides a stock of every size and type of brush in use in the town, both on consumers' own and hired motors. There are over 40 of these, and they are each given a number, which is also painted in large figures on the motor frame. A card system is used to record the history of each motor.

The company act as wiring contractors, and always have a staff of wiremen available. The permanent wiremen and mains staff are all trained for motor work, and one man in particular spends most of his time on motor repairs, and is as often as not in the works and readily available for emergency calls.

If a report of a breakdown is received, a man is sent out at once and reports by telephone if the failure is such that it cannot be repaired quickly on site. In that case he sets to work to get the faulty motor disconnected and removed from its bed. Particulars of the drive at the same time are ascertained at the works, and a suitable motor is selected from stock. A motor or horse lorry is ordered, preferably the former, and the motor is slung up and very little time lost in getting it on site.

Battens are taken to the job with it, and as the old bolt centres are probably wrong it may be necessary to screw the battens down with the old foundation bolts (if these are set in concrete), and coach-screw the motor down to them. Usually, however, motors are already fixed on battens wide enough to allow of considerable variation in bolt centres, so that little time is lost in fixing down another motor to them.

As a motor is often fixed in a room which can only be reached by taking it up two or three flights of stairs, a good deal of experience and some ingenuity is needed in handling it quickly and safely. Sometimes in the case of small motors, up to say 5 H.P., it is quickest to remove both end shields and take out the armature, when the motor can be carried up in pieces.

Pulleys are sometimes made to fit the shaft too tightly and are driven on hard; they are best shifted with a pair of screw pulley drawers. Keys are now always fitted with gib heads.

In may cases a small motor, up to say 5 H.P., can be changed in an hour and a half from the time of the breakdown, but possibly a more usual period from the notification of stoppage to the time a new motor is running is double this.

Large motors cannot be handled nearly so quickly, but by having men working simultaneously on the old and new motors while at the same time the pulley is being prepared, it is by no means impossible to change a 30–50-H.P. motor in 2½ to 3 hours.

The majority of stoppages are due to starter troubles, and of these the bulk are caused by burnt-out resistances or open-circuited hold-over coils, these fairly frequently failing at the leading-in wires. Most starter defects can be remedied, at any rate temporarily, on site. If not, a fresh starter is telephoned for. In the case of a large motor it is usually quicker to repair a fault on a field coil on site than to change the motor. It means removing one end, taking out the armature, and perhaps removing a pole-piece to get the coil out. By cutting away the outer tape before dismantling one can usually judge as to whether the trouble is sufficiently near the surface for a fairly quick repair to be possible. If the breakdown occurs in the afternoon a large motor is never changed for a field-coil repair unless it is a genuine burn-out.

In the case of armature faults it is often possible to make a temporary repair on site which will keep the motor running until a week-end. The commonest fault, especially in small armatures wound with fine-gauge conductors, is a break at the point where one of the ends bends away from the coil. One can frequently get over this in lap-wound armatures by soldering across the commutator lugs.

The surest way to keep down the cost of repairs is to educate one of the hirer's employés to keep the motor clean and the armature and field coils blown free from dust, to see that brushes do not wear down too far, and to keep a proper level of clean oil in the bearings. As a breakdown entails interruption of the user's business, he will usually see that one man is made responsible for a particular motor and that he gives it ten minutes or so of attention, say, once a week.

It was at one time thought that periodic inspection would lead to a diminution of breakdowns, but this, after being tried, was abandoned. It has been found more advantageous to risk a motor running till it fails than to inspect 20 or 30 motors on the chance of detecting one which needs attention.

When a hired motor needs general overhaul it is taken entirely to pieces, the commutator turned, the mica recessed and the armature and field coils varnished with a suitable insulating varnish. Bands are inspected, and if at all slack are replaced, and fresh whip-cord if necessary is wound on. Bearings are inspected and re-white-metalled if necessary, or, in the case of bushes, new ones fitted if required, or the old ones lined with white-metal. The brush-gear is taken to pieces and overhauled, and the frame thoroughly cleaned with petrol and finally painted. The colour is a grey, but the actual shade is changed each year, thus giving a rough guide as to how long a motor has run since the last overhaul. Finally, the machine is run for eight hours at full load driving another motor as a dynamo, and if satisfactory it is ready to be sent out again. It is believed that a motor sent out smartly painted and looking like new is likely to receive more careful attention than if issued in a shabby condition. There seems to be no doubt that the user takes a pride in keeping it in good condition.

When a rewind is necessary the repair is usually done at the works, the necessary coils being bought from the makers.

The question frequently arises whether in a particular case it pays to rewind rather than replace one or two faulty coils. It is very annoying after fitting a couple of coils to find that another has been damaged in lifting. It is still more provoking if the second failure does not occur until the armature has been belted and the motor re-assembled and tested. If the original faulty coils have been overheated to such an extent as to be useless as a guide to the condition of the rest, it is probably a good plan to scrap an additional coil and bend the wire to see if the cotton is perished and breaks easily. If so, it should certainly be rewound, because the coils which have to be lifted are almost certain to be damaged during the process.

Armatures should, of course, have a preliminary fall-of-potential test before the ends are sweated into the commutator. In connection with voltage-drop tests generally, the author would draw attention to what he believes is a fairly common error, namely, putting the current leads on opposite ends of a diameter or separated by an angle corresponding to the brush positions. If this is done and there are equalising connections, confusion is apt to arise, especially if, as is sometimes the case, one or more equalising wires are broken. If the current leads as well as the millivoltmeter leads are both applied to adjacent bars, the effect of possible trouble with equalising connections is eliminated.

One cannot lay too much stress on the importance of recessing the mica below the surface of the copper on the commutator. The saving in brushes is most marked, and in a few instances in particular it is little short of astonishing. Motors which have been known to consume a set of brushes in three weeks will go for twelve months without a single new one.

In 1914 the cost of carbon brushes per H.P. was 7d., and per motor 3s. 7d.

An effort has been made in recent years to adopt a standard motor, past experience having shown up a number of defects in various makes.

The principal points looked for are a liberal rating without undue weight and bulkiness, ease of dismantling, large bearings, and an accessible commutator. Suitable brush-gear is also a consideration. No brush-holder except of a positive radial type should be fitted to a motor. Old motors with obsolete brush-gear have been wonderfully improved by changing the holders.

Ball bearings should be avoided, for they are most unsatisfactory. Narrow pole gaps are also a great source of trouble. The small saving in efficiency is certainly outweighed by the greater risk of armature breakdown caused by a faulty bearing. Bearings inevitably wear; therefore such breakdowns are inseparable from motors with narrow air-gaps.

Price is the least consideration when one has to be responsible for the upkeep of the motors; hence cut prices and extra high speeds are avoided. On the other hand, very low-speed motors are unsuitable, on account of their size, for general hire work.

British motors are obtainable which fulfil most if not all of the above conditions.

It is unfortunately a fact that motor starters have not yet reached a very high state of perfection; the author has not yet been able to find one which combines a good resistance element with sound switchgear. Undoubtedly carbon with its negative temperature coefficient is the right material for starting a large motor. The largest motor on the author's mains is one of 250 H.P., which is started with a carbon resistance. This motor has a rope drive, and on the first contact takes 100 amperes. This current slowly increases and the motor begins to strain at the ropes until at about 160 amperes it slowly starts to move. Not only does such a start save unnecessary shock to the conductors of the motor, but it minimises the disturbance to the supply.

Starters are mounted on a wooden board plugged flat on the wall and covered with asbestos-cement sheet. All wires are carried on the face of the board and fixed neatly with cleats. Mains are also run on cleats, a short run of screwed tube only being used from the starter to the motor.

The author wherever possible prefers a belt drive to any other (except for heavy drives, where ropes are preferable).

Motors are preferably fixed on the floor, as they certainly receive more attention in this position. Occasionally there is no alternative but to mount them on brackets or hangers, or to hang them inverted from the ceiling.

For large motors, say over 50 H.P., which cannot be easily replaced at short notice, it is advisable to keep a spare armature and field coil. In the case of a large mill with a number of similar groups the author recommends the installation of duplicate motors as far as possible throughout, keeping one complete motor as a stand-by.

In opening the discussion, Mr. T. Roles (Bradford) stated that the prime cost of the motors—both A.C. and D.C.—at present hired out by the Bradford undertaking, was about £53,000, the largest machine being of 300 H.P., and the smallest ½ H.P. The Bradford hiring rates had never been increased or reduced since the hiring scheme was inaugurated, except in connection with some of the larger sizes of motors. He did not encourage consumers to adopt the hire system for motors of over 30 or 40 H.P. Quite a number of consumers in Bradford had bought their motors outright rather than continue to pay hire for them. He thought that the annual charge for hire should not be less than 15 per cent. on the total cost of the motor, slide rails, and starter, seeing that the rental had to cover repairs, maintenance, inspection, interest, and depreciation, and that, based on a 15 years' life, from 8 to 9 per cent. of the total cost would be required annually

for interest and depreciation alone. Since 1906 hired motors had been depreciated yearly on the basis of 6 per cent. of their prime cost, and at the present day the hiring department was in a very satisfactory financial position. Brushes had to be paid for by the hirer, as had also the cost of any extraordinary damage which a motor might sustain. Practically all repairs were effected in the department's own works. He thought it very desirable that a hiring scheme should be in operation in connection with an electricity supply undertaking.

Mr. C. E. Allsopp (Bradford) said that in Bradford, for the year ended March, 1915, there were approximately 1,100 motors on hire, representing about 4,139 kw., out of a total number of 2,551 motors on circuit. At the present time the number of machines on hire was 1,262, representing 7,337 kw., an increase of 162 motors and 3,198 kw. in less than twelve months. They fixed plates on the motors stating that they were hired; this precaution was necessary in case of bankruptcy. The weight of the motors was also stamped clearly on the machines. In Bradford they found that a six-hour test was more than sufficient. He commented upon the necessity of having a highly efficient repair staff, and said that in Bradford they made their own coils readily at a very much lower cost than would be entailed by purchasing them from the makers. It was quite possible to standardise starters from 5 to 20 h.p. with interchangeable overload and no-volt coils, and he recommended "asbestin" covering for the coils in case of anything going wrong with the motor. Speaking from experience, he wished every machine they had at Bradford was fitted with ball bearings. By adopting ball bearings the air gap could be considerably lessened, with very good results. He had had considerable trouble with white-metal bearings; at Bradford they had had a number of machines running for years with both bearings, and he voted for the gun-metal mixture or the ball bearing.

Mr. R. H. Campion (Dewsbury) did not think it worth while to hire motors for cranes and hoists. With regard to ball bearings, he had found that the repairs in connection with them were very costly.

Mr. W. B. Woodhouse (Dewsbury) said that to make one charge cover all services seemed to him, from the commercial point of view, an ideal arrangement. He had come to the conclusion that 20 per cent. was a reasonable figure, but when this was put to the Yorkshireman he preferred to buy his motor rather than hire it. At the outset electric driving had been hampered by manufacturers, wiremen, and motor men all giving advice, the power user coming to the conclusion that it was an unsettled sort of business, and the engineers did not quite know what they were doing. The second portion of the paper was as valuable as the first, because it was good to know what troubles one met with, and how they should be dealt with.

Mr. W. M. Selvey (Sheffield) said that one of the most vital matters was the question of the size of motor. By putting in too large motors they got bad power factors and wattless currents.

Mr. W. Lang (Leeds) said that in Leeds, when the Corporation proposed going into this business, very strenuous objection was raised by motor manufacturers and electrical contractors.

The Chairman, Mr. H. H. Wright, said that the rates charged by the hiring company appeared to be exceedingly high as compared with those of corporations in the district, and that being so, he thought the profits of the company ought to be larger. He thought it best to arrange a minimum period of twelve months' hire, so that they knew exactly where they stood. He did not think it paid to insure motors with an insurance company, provided the machines were reasonably looked after; the insurance rentals against breakdown worked out at something like 5 or 6 per cent., and he knew many cases where there had not been any repairs for five or six years. He agreed with Mr. Allsopp in regard to bearings. At least 90 per cent. of breakdowns were due to oil getting on the windings. He considered it to be very important to have a clause inserted in the hiring agreement whereby, in case of the bankruptcy of the hirer, the landlord could not distrain upon the motor; the same thing would apply to a mortgagee of the property.

The Author, replying to various points raised in the discussion, said that at Hawick the power users did not want to be bothered at all with their drives, but turned the whole thing over to the company, with the result that they did not quibble about little matters. The company practically undertook to insure the whole of their drives, and provision was made for such contingencies as bankruptcy. His principal objection to ball bearings was that they could not be handled quickly; undoubtedly, if white-metal bearings let them down, they let them down badly, but they had not found much trouble from that cause in actual running. An objection to phosphor-bronze bearings was that when they seized, they seized badly. During the past five and a half years the drives at Hawick had got larger, particularly in the hosiery industry, with the result that one was continually changing the size of one's motors in the mills. At Hawick they had not had any trouble with contractors, because they had not any in the town, though they had had to make a firm of manufacturers feel rather uncomfortable when they attempted to quote prices representing 33⅓ per cent. off the proper charge, whilst his company were hiring motors out to customers at a higher figure.

THE USE OF CONTINUOUS CURRENT FOR TERMINAL AND TRUNK-LINE ELECTRIFICATION.

Discussion at Birmingham.

Mr. Storer's paper was read before the Birmingham Local Section of the Institution of Electrical Engineers on March 15th. An abstract of the paper was printed in the Electrical Review of March 24th and 31st.

Dr. C. C. Garrard said that the paper appeared to be largely a plea for standardisation of railway equipments in this country, and the suggestion was made that this matter should be taken in hand by the Institution of Electrical Engineers. Mr. Storer was of a somewhat sanguine temperament if he thought that this would be done. The Institution had not a standardisation committee or any other machinery whereby this and other problems could be dealt with. The American Institute of Electrical Engineers had such standing committees, and there was no doubt, to his mind, that the development of electrical engineering in this country was hindered by the failure of the Institution of Electrical Engineers to take the lead in such matters. The Engineering Standards Committee dealt with such a wide field that electrical engineering could only receive a small portion of its time and attention. These important electrical problems should be tackled by the Institution, which could put them into such shape that they could be presented to the Engineering Standards Committee as the considered view of the electrical profession. The Engineering Standards Committee would then see that the views expressed fitted in with those of other branches of engineering, and could eventually adopt them as a British standard specification. If this scheme could be arranged, he was sure progress would be greatly accelerated.

Mr. F. W. Carter said there was in some quarters, even now, a disposition to argue in favour of shunt or separately-excited motors, but, from an operator's point of view, the series motor was the only thing possible. He would like to have from the author a more explicit statement of the service conditions which he considered justified the use of field control. If S were the maximum permissible speed of the train, in miles per hour, D the diameter of the motor-driven wheels, in inches, x the ratio of gear reduction, and N the maximum speed of the armature in R.P.M., these quantities were connected by the following equation:—

$$Sx \times 88 \times 12/\pi D = N.$$

The quantities S and D might be considered as being specified, whilst a maximum limit could be assigned to N by the designer. If, now, the motor were designed so as to use a larger gear reduction than that given by the above equation, the armature speed would sometimes pass beyond desirable limits, whilst if the gear reduction were less than that given by this equation the motor was not used to the limit of its mechanical capacity, and could be made more efficient or lighter or of greater capacity by reducing the number of armature bars, until the appropriate gear reduction satisfied the above equation. By starting the design with this equation, therefore, and deducing the number of armature bars in accordance with it, the most effective use was made of the active material. The above applied whether the motor was designed for operation with a single field or for field control. For a particular service, the comparison between motors must be based on the assumption of approximately similar characteristics on the normal fields; if it were desired to compare the operation of a particular motor with and without field control, it was necessary to use a greater gear reduction for the field-control motor; but from the discussion given above it would be clear that in this case either the field-control motor ran to a higher speed than was desirable, or the saturated-field motor could be improved by redesigning it so as to satisfy the equation given above; that was to say, the gear reduction was either too great in the field-control motor or too small in the other. The comparison between field-control and saturated field motors should not be made on the basis of using the same motor in the two cases, but on the basis of the best motor a designer could offer in the respective cases. Under these conditions the field-control motor would be somewhat heavier and more expensive than the saturated field motor. To sum up the advantages and disadvantages of field control, the advantages were as follows:—

1. There was a saving of energy, as explained by the author.
2. For locomotive-hauled trains there was an increase of flexibility, which was not only desirable but necessary in many cases.
3. For multiple-unit trains it frequently enabled an otherwise unsuitable motor to be employed by using it nearer to the limit of its mechanical capacity.
4. It enabled trains to meet special speed restrictions outside the ordinary schedules.

The disadvantages of field control when comparison was made on the basis discussed above were:—

1. The motors were heavier and more expensive.
2. They were slightly worse in operation on account of the weakened field.
3. The control equipment was heavier and more complicated. In many cases field control had not shown sufficient advantage over the ordinary series-parallel control to justify its use. At

the same time, it was frequently a valuable feature of which advantageous use could be made. With regard to the author's conclusions, whilst standardisation was highly desirable from some points of view, he could hardly blame the railway companies if they were indisposed to admit this at the present time; the advantages of higher D.C. voltage were too recent to justify them in concluding that finality had been reached, and, in fact, the system using 5,000 volts was only of last year's development. It was pleasing to see that the author referred to the 600-volt system as not only being thoroughly established, but as being so well suited to the requirements of terminal electrification that it should be continued as one of the standards, at least for the present. This was the oldest system in use for operating railways, and there was always a disposition, when something newer appeared, to consider that it was superior to the older and necessarily superseded it. If, however, the question of electrifying such a system as the London underground railways came up at the present time, the sound considerations given by the author, where he said: "The determining factor in the entire question will, of course, be the cost, not only of the original installations, but the cost of operation and maintenance," would lead to the same solution as was arrived at by the Underground Railways Co. at the inception of their project. The author's final paragraph was important. In this country the main lines and the local lines were very largely distinct, and if one system of operation were considered best for local service and another system for main line service, the two systems would be largely concerned with separate tracks; if a different system of line conductors were considered desirable for the two classes of service, the few lines which it would be necessary to equip with both systems of line conductors would add little to the cost of the installation, as compared with the additional expense that would be incurred in adopting an unsuitable system of operation either for the main line work or for the local work, in order that a single system of operation might be employed throughout the railway.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Foreign Trade Successes.

You have frequently emphasised in the columns of your paper the necessity for the expansion of foreign trade, and therefore we think you will be interested in the following list of orders received by this firm from abroad during the last few weeks:—

Country.	Goods.	Value.
France	Switchgear and transformers	£15,000
Denmark	Transformers and meters	7,000
Holland	Transformers and switchgear (including 2-4,000 K.V.A.)	3,500
China	Meters	8,000
Russia	Instruments and meters	2,500
Spain	Meters	1,500
Australia	Meters	4,000
S. America	Meters	1,000
India	Meters	1,500
Other Countries ...	Meters	2,000
		£46,000

Ferranti, Ltd.

London, W.C., *April 1st*, 1916.

Canada and the Metric System.

No one who has had a scientific training can doubt the enormous advantage to British traders of changing to a decimal system, and the writer is in very hearty accord with the effort at present being made by the ELECTRICAL REVIEW to give prominence to this extremely important subject.

In order that the fullest possible benefit should be derivable from such a change, however, the whole of the British Empire should partake in it, and to that end it would be necessary to enlist the sympathies of the people of the Dominions. In the case of Australia, New Zealand, and South Africa this might not be so difficult; but Canada, owing to her proximity to, and intimate relations with, the United States, is in a different position, since it is not certain that Canada's big Southern neighbour would care to follow in the lead of the British Empire, and if she did it would make the task of British traders just that much harder, since the United States would have gained the same advantage in dealing with the world's markets. At the same time, this is not a very strong argument for keeping Canada out of line with the rest of the Empire, since her business men could more easily adapt themselves to the needs and requirements of the United States if the systems of weights and measures, &c., were different in the two countries than they can at present to those of some far-away country like Italy, Spain, or France, especially as there would be, in the former case, the supreme advantage of a common language.

Canada, like the United States, is in the rather awkward position which arises out of having adopted a decimal system only in a few directions, leaving others entirely unchanged.

The money, of course, is decimal, but articles are still sold in dozens, and to reckon out how much 2¼ dozen buttons are worth at, say, 17 cents each, is quite an arithmetical feat for a former inhabitant of the Old Country, and, it is suspected, does not come any too easy even to a native.

Again, the measures of length are the same as at home, but the hundredweight is 100 lb., and the ton is 2,000, which latter are certainly improvements where decimal money is used, but the ounce is unchanged, making the reckoning of the cost of lb. with odd ounces an awkward item.

Cantuck.

[Our correspondent writes of existing conditions. But what of the future? What if the United States takes the initiative and adopts the metric system before we do? Already the medical work of the U.S. Army, Navy, and Public Health Service is carried on wholly in the metric system; so is that of the Bureau of Standards and other scientific departments; the system has been adopted in the Philippines and Porto Rico; scientific, engineering, and industrial organisations have urged Congress to take action; the U.S. Department of Commerce is in favour of it; and the movement is steadily gaining strength. If the United States decides to make the plunge, can the British Empire stay out in the cold?

Australia and New Zealand long ago advocated the adoption of the metric system throughout the Empire, and the Colonial Premiers in Imperial Conference have passed resolutions to the same effect. If we do not move soon, our rivals will—and then, as usual, we shall be "too late."—EDS. ELEC. REV.]

Cause of Flicker.

We note the suggestions made by your correspondent, Mr. J. W. Long, that the flicker in the light may be due to faulty valve setting causing unequal distribution of steam; also, that Mr. Bulsara should write to us for enlightenment and guidance. Concerning this, we have to say that, although at various times during the past 15 or 20 years a number of cases of flicker have come under our notice, in no case have we known the trouble to be traced to defective valve setting or to be remedied by readjusting the valves. We hardly see how the comparatively slight inequality due to a slide valve being out of position could produce such a result with the liberal proportion of fly-wheel effect and the fine degree of even turning there is with a high-speed steam engine, bearing in mind that in times past, at any rate, electric generators have been successfully operated by high-speed "single-acting" engines. If faulty valve setting or slight looseness in the valves could produce such an effect, complaints of flicker in the lights would be far more common than in our experience they are.

Belliss & Morcom, Ltd.

Birmingham, *April 3rd*, 1916.

Electricity in Agriculture.—Miss E. C. Dudgeon, of Lincluden House, Dumfries, has during the past few years carried out a number of interesting experiments in the growing of crops by means of electricity. The results she has attained in the case of potatoes were very marked. In 1912, the yield was 10 cwt. 3 qr. more per acre than without the electricity; in 1913, 13 cwt. 3 qr. more; and in 1914, 1 ton 3 cwt. more. Last year the oat crop was experimented with. From the very commencement of growth, the oats under electrical treatment showed a conspicuous difference, and they did not suffer from the prevailing drought to the same extent. When the crop was harvested there was a difference of 31 per cent in grain and 63 per cent in straw in favour of electrified oats. Miss Dudgeon considers that the experiments justify the following conclusions:—(1) That under the influence of the electric discharge the ingredients and the soil necessary to plant growth are rendered more soluble, and therefore more easy of assimilation; (2) that by the aid of electric current sap is enabled to flow more vigorously, and the formation of sugar and starch is increased; and (3) respiration absorption, and evaporation are accelerated, and by increased chemical activity in the plant its whole fabric is improved. With regard to the cost of electrical treatment of crops Miss Dudgeon considers there is no reason to doubt that the apparatus required, and its method of working, will come well within the means of any practical farmer who has a little knowledge of the subject, and that the increase of crop will repay with interest the outlay entailed.—*Aberdeen Journal.*

Russian Government Electricity Measure.—A Government conference has been held on the supply of electricity. It was shown that with the existing scarcity of fuel it was necessary to consider at once the means of assuring a supply of electrical energy which would aid in solving the motor difficulty. It is proposed to use liquid fuel (petroleum) in place of the coal that cannot be got. A project of law to this effect, already drafted and published, has been approved.

TECHNICAL EDUCATION AND INDUSTRIAL RESEARCH.

Many wild statements have been made during the past 18 months on the subject of education, science, and research, and there have arisen schools of theorists with enthusiasm as their virtue and vagueness as their fatal defect. The national crisis has aroused them to well-meaning frenzy and secured a wide and sympathetic hearing for their proposals, particularly amongst those who, from previous ignorance, are unable to discern beneath the attractive surface of so many of these sweeping proposals a lack of definition and a failure to analyse the needs of the case, and correlate them with practical possibilities. Too many sovereign cures have been recommended with too little justification, and too much faith has been pinned on vague schemes for State aid and private organisation, whilst overlooking the fundamental importance of individual effort. Science has been regarded as a panacea for all ills, and there has been a tendency to forget that not only the general organisation and higher commands of the industrial army, but also the vast body of that army itself must receive attention. Those who begin life as manual workers must—with exceptions which are important in themselves, but almost negligible in point of numbers—remain manual workers to the end. In order that they may make the best of their opportunities and render the greatest good to productive industry, it is necessary that these workers receive suitable education during the critical years between the time they leave school and the time when their attitude towards industry and their position and prospects therein may be regarded as fairly definitely fixed. As pointed out by various speakers—Dr. W. Garnett and Mr. A. P. M. Fleming amongst them—at a recent discussion by the Circle of Scientific, Technical, and Trade Journalists, there is insufficient discrimination in our existing facilities for technical education between the needs of the leader of industry, the technical expert, the works manager, the foreman, and the skilled worker. Provision is already made more or less satisfactorily for the technical education of non-manual workers in the industrial army, but the needs of the manual worker are sadly neglected.

In this matter, which primarily affects juvenile workers, responsibility rests with manufacturers themselves, and, whilst Dr. Garnett emphasised the necessity for more practical education in schools, Mr. Fleming drew attention to the benefit accruing to workers and employers alike from works schools. Having investigated the problem, if only on the ground that it is a sound commercial proposition, the employer must provide the necessary training himself or make his voice heard in demanding that this kind of education be provided. In either case, the employer must contribute at least to the extent of granting juvenile workers class-time during working hours, for it is physically impossible that such workers should study hard and effectively during what should be their leisure hours.

Apart from the more or less specialised education of industrial workers, Dr. Garnett makes an urgent plea for the wider diffusion of popular science. Broad education of the general public, both at school and by popular lectures, would secure a more intelligent and sympathetic appreciation of industrial and scientific needs, conditions, and proposals; it would aid fathers in selecting a definite training and aim for their children; and it would bring home to legislators and capitalists the fact that every scientific discovery sooner or later finds its place in industry.

Following upon the question of education, which is its indispensable precursor, comes that of research. Purely scientific research should never be confused with industrial research; nor should either be regarded as of minor importance. Both are to be encouraged by every means at our disposal, but with this important distinction, that the pure scientist exploring unknown fields in search of knowledge for knowledge's sake cannot usefully be subjected to any organisation or restraint, whereas industrial research is mainly directed towards the solution of definite industrial problems, though it may yield incidental scientific discoveries. Numerous instances quoted by Mr. Fleming show, if further proof be needed, that industrial research on a large scale and well organised is always a commercial proposition. There are now upwards of 50 corporations in the United States having research laboratories costing annually from £20,000 to £100,000 each for maintenance. Recent advances in long-distance wireless telegraphy have been due largely to work in the Western Telegraph Co.'s research laboratories; the rustless sheet-iron of the American Rolling Mills Co. is a research laboratory product; a new industry for the manufacture of commodities from synthetic resins had its inception in the scientific work of the General Bakelite Co.; and half-a-dozen new factories have been started as the result of discoveries in Edison's laboratories since the outbreak of war. To quote Prof. Gregory, industrial research is primarily a commercial matter, and will be taken up by all our big firms directly they realise how profitable it is. The pure scientist, however, cannot be chained to any particular research, yet his work may be of far greater value than any industrial research. In Faraday's "magnetic spark" there originated every central station in the world to-day, and from Maxwell's electromagnetic theory of light there came the Marconi trans-Atlantic wireless stations.

Between the inception of a purely scientific investigation and its application to industry there lies generally a wide field demanding much patient labour before a track can be beaten across it. The first fact to be realised is that the several stages in the completed task are all equally important. Each must be encouraged—in spirit and by act—and the final fruits of labour must be distributed equitably between all the workers concerned. The original inventor or discoverer and the originator of the commercial application of his results should both share in the profits, and if the intermediate work has been aided by public funds it is only fair that the State should also participate in profits in order that further progress may be made in similar manner.

College laboratories may be more usefully employed than at present in the conducting of purely scientific research and in the performance of "scientific work to order"—the order being placed by industrial firms and ultimate profits being divided between the firm, the college, and the research worker. One of the most important functions of the Advisory Council for Research seems certainly to lie in organising, classifying, and supplementing existing facilities for research in public institutions, and in bringing manufacturers and scientific investigators into close association. It is in the preliminary stages of scientific investigation that college laboratories can be most usefully employed. There are some industries (*e.g.*, leather tanning and process-block making) in which the operations are the same for a single piece of work as for a thousand, but generally the college laboratory cannot undertake the commercialisation of scientific discoveries. Standardisation work and the testing of materials are provided for by the National Physical Laboratory, and appreciation of the sterling services rendered by this institution is extending rapidly.

There remains, however, a most important class of work, and one for which additional facilities must be provided in this country. These facilities should take the form of monotechnic institutes equipped for undertaking experimental work under commercial conditions, on a broader basis than the industrial research conducted by individual firms, and in the interests of all members of a particular trade or group of associated trades. Manufacturers would not be called upon to reveal secrets they already possessed or might thereafter discover, and they would certainly gain more than they would lose by sharing with others the knowledge acquired by combined industrial research. The cost of special trade research institutions could be met by a purely nominal levy on the capital of firms interested—for instance, an annual subscription of 0.1 per cent. on the capital invested in engineering works would yield about £300,000 per annum for research institutions and research workers—but in certain directions it would probably be expedient to provide State subsidies. There are, for instance, many researches of great importance to a large section of industry which fall outside the scope of pure science and are not of such a nature as to justify a single firm in undertaking the work at its own expense. It would, then, be equitable to credit the State with a proportion of the profits derived from the results of work conducted under subsidy. This could be done by State patents, or other means, and in the course of a few years fresh subsidies should be covered by research revenue. It would be necessary also to protect the interests of the research workers themselves and to provide against their disposing privately of information acquired during their investigations.

The danger particularly to be averted is that of relying too much on State organisation and aid, particularly at the present time, when technical education and research have still to be given really practical effect in this country. It cannot be emphasised too strongly that the main-spring of the movement is, and must be, the employer (particularly the manufacturer) himself. Manufacturers must abandon their policy of isolation, for there is no longer anything "splendid"—much less profitable—therein. Trade associations should be organised to secure suitable educational facilities for their employés (present and potential) and to make the best use of trained men supplied by trade schools and colleges. The question of the manual worker's education is one of extreme importance, and should be solved in detail by each employer, though his trade association could, and should, furnish much valuable assistance. The same trade associations should concern themselves with superintending the research work in which they are interested and in collecting and distributing information among their members. They should keep in close touch with the Advisory Council for Research, and should endeavour to frame their policy in conformity with arrangements made for industrial research as a whole, but, if State aid is not forthcoming promptly enough and in suitable manner and degree, it is the clear duty of trade associations to frame schemes for independent action. It is of the utmost importance that individual and concerted trade action be taken at the earliest possible moment, always, however, with a view to supplementing present and future central action on a national scale. It would be as foolish for trade associations to do otherwise than aid in building up a central national organisation, as it would be for the latter to take definitely effective measures without the co-operative help of individual trades. The intimate acquaintance of trade associations with the actual needs and conditions of the industries they represent is indispensable, and these mobile associations should set to work to define and supply their own needs as far as possible and to aid in building up an effective central organisation.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

FRENCH WEST AFRICA.—New Customs Regulations have been established by a recent Presidential Decree. They are based on the Customs Legislation in force in France in so far as the latter can be adapted to the local necessities of the Colony, and deal in detail with the procedure to be followed in respect of the importation, exportation, transit, and warehousing of goods (including provisions as to the declaration of goods for Customs purposes), the procedure in cases of dispute as to the kind, quality, origin, or value of imported goods (*expertise*), &c. The complete text of the Regulations may be consulted at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

PERU.—A new Law, dated December 29th, makes provision for the increase of the Customs duties levied on certain goods imported into Peru.

The following goods, which have hitherto been on the free list, are to pay import duty at the rate of 10 per cent. *ad val.*:—Tin in bars and sheets; lead in bars or in unserviceable articles; steel cylindrical axles; liquid mercury; copper, brass, or bronze, in bars or sheets; asbestos or asbestos yarn, asbestos cement; steam boilers and feed pumps for same; passenger cars for railways or tramways, with any motor; locomobiles and locomotives with or without boilers; cranes.

Duty at the rate of 5 per cent. *ad val.* is payable on the undermentioned goods:—Steel bars; hoops of iron or steel; wire cables (hawsers); zinc in bars; iron sheets from 3 to 15 mm. thick; steel wire; round wire or wire resembling ribbon.

The following goods are to be subject to import duty at the specific rates shown:—

	Per kilog.
Machines of all kinds, hitherto free of duty, weighing up to 100 kilogs. (gross weight) ...	10 centavos.
Machines of all kinds, hitherto free of duty, weighing more than 100 up to 5,000 kilogs. (gross weight)	5 centavos.
Machines of all kinds, hitherto free of duty, weighing more than 5,000 kilogs. (gross weight)	2 centavos.

Among the goods that will continue to be admitted free of duty are irrigation pumps.

The Ministry of Hacienda is to fix, within 90 days from the promulgation of the Law, the specific rates of duty which are to be assessed as the equivalent of the 10 per cent. and 5 per cent. *ad. val.* rates mentioned above. For the purpose of converting these *ad val.* duties into specific rates, the prices current before the outbreak of the war are to be taken as the basis.

The Law also provides for the following, among other, modifications of the tariff of fees charged by Peruvian Consular Offices:—

The fee for the certification of the four copies of each invoice of goods shipped to Peru is increased from 1 per cent. to 2 per cent. of the value of the goods.

The charge (under No. 46 of the Consular Fee Tariff) for certification of the copies of ships' manifests is suppressed, and in substitution therefor the fee for the legalisation of signatures (2 soles) is to be levied for the visa of such documents.

For the certification of manifests for cargo that has to be transhipped, the fee for the legalisation of signatures is to take the place of the fee prescribed in No. 47 of the Tariff.

No. 48 of the Consular Fee Tariff, which provides for a fee of 50 centavos for the certification of the two copies of the general manifest, or of each one of the various manifests that, according to Article 113 of the Consular Regulations, must be presented by the captain of the vessel to which the merchandise has been transhipped, is to remain in force.

The Law further provides that a special duty of 20 centavos per 100 kilogs. (gross weight) is to be levied on all goods (with the exception of bulky goods which are cleared without entering into warehouse) imported through the *Callao* and *Mollendo* Custom Houses.

[Note.—The Peruvian sol (100 centavos) is equivalent to 2s., but for Consular Tariff purposes it is taken as 48d. sterling.]

NEW PATENTS APPLIED FOR, 1916.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

4,098. "Electric contact keys, electric buzzers, &c." H. Rottenburg. March 20th.

4,109. "Joint for electric cable." E. A. Claremont & A. E. Tanner. March 20th.

4,110. "Manufacture of incandescent lamps." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 20th.

4,115. "Electric arc soldering." E. H. Jones. March 20th.

4,136. "Means for securing electric lamps, &c., in sockets." T. H. A. Brown. March 20th.

4,182. "Shaping wire." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 21st.

4,184. "Electrical condensers and condenser systems." W. A. Clark, H. G. Longford, W. W. Longford, T. Morris & Sphinx Manufacturing Co. March 21st.

4,190. "Process for electrolysis of alkali chlorides." R. van Hasselt. March 21st.

4,192. "Sparking plugs for internal-combustion engines." W. P. Gilbart, Griffiths, Gilbart & Co., and R. A. Griffiths. March 21st.

4,196. "Means for indicating state of adjustment or output of dynamo-electric machines." J. Stone & Co. (H. D. Rohman). March 21st.

4,240. "Electrical treatment of liquids and fluids and products resulting therefrom." J. E. Bloom. March 22nd.

4,247. "Electric transformers." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 22nd.

4,254. "Electric signalling apparatus." F. G. Baily. March 22nd.

4,279. "Electric flash lamps." Brass Flask & Capsule Co. and S. Peplow. March 22nd.

4,288. "Interrupters for magneto-electric machines." A. M. Allen & R. B. North. March 22nd.

4,295. "Inductances for wireless telegraphy, &c., and manufacture thereof." E. R. Clarke. March 23rd.

4,320. "Protective gear for electrical circuits." A. E. McColl. March 23rd.

4,331. "Means for protecting alternating-current generators and transformers." A. E. McColl. March 23rd.

4,334. "Locomotives." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 23rd.

4,337. "Automatic block-signal systems." National Safety Appliance Co. March 23rd. (U.S.A., June 30th, 1915.)

4,338. "Magnetic separators." F. Krupp Akt. Ges. Grusonwerk. March 23rd (Germany, October 22nd, 1915.)

4,342. "Electric light reflectors." C. H. Pitman & M. J. Railing. March 23rd.

4,343. "Means for controlling electric lighting of motor vehicles." W. Curtis. March 23rd.

4,347. "Telephone systems." T. Pettigrew. March 23rd.

4,348. "Arc projector lamps." J. Brockie. March 23rd.

4,363. "Application of tumbler switches to walls, &c." G. A. C. Thynne. March 24th.

4,373. "Trolley head for trams, &c." S. Henshaw. March 24th.

4,376. "Maximum-demand indicators for electricity, speed, and other registering apparatus." Chamberlain & Hookham and S. James. March 24th.

4,399. "Controlling mechanism for electric circuits." British Thomson-Houston Co. & W. L. Wise. March 24th.

4,402. "Telegraph machines." L. M. Potts. March 24th.

4,407. "Telegraphy." Muirhead & Co. and G. O. Squier. March 24th.

4,413. "Electric flash lamp attachments." British Ever-Ready Co. & T. Y. Unwin. March 24th.

4,453. "Leading-in conductors." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 25th.

4,467. "Magnetos." A. Guedatarian. March 25th.

PUBLISHED SPECIFICATIONS.

1914.

15,580. Connections for Electrical Condensers. H. Aland. June 29th. (June 28th, 1913.)

21,992. Method of Automatically Switching off Defective Sections of Electric Distributing Nets. M. Hochstadter. November 4th. (March 12th, 1915. Convention date not granted.)

24,074. Trolley Poles or Bows for Electrically-propelled Vehicles. G. Meyer. December 15th.

1915.

2,004. Lanterns for use with Gas, Electric, or other Lights. J. A. Chell. February 8th. (July 7th, 1915.)

3,329. Sanitary Telephone Mouthpieces. E. M. Jenkins. March 2nd.

3,410. Apparatus for Exhausting Lamp Bulbs and other articles, and Testing the Vacuum therein. British Thomson-Houston Co. (General Electric Co., U.S.A.). March 3rd.

3,420. Electric Impulse Transmitters, particularly adapted for Signalling purposes. A. Stern. March 3rd.

3,523. Electric Signalling Systems, particularly adaptable to Telephony. International Electric Co., H. E. R. Roose & R. G. le Noir. March 4th.

3,569. Method and Apparatus for the Electro-deposition of Metals. C. E. S. Bell & L. G. Scott. March 5th.

3,575. Electric Radiators. J. R. Quain. March 5th.

3,706. Electric Push Buttons. G. E. Roedding & E. B. Roedding. March 8th.

3,733. Electrical Switches. A. C. Wynne. March 9th.

3,953. Electric Furnaces. E. K. Scott & F. Howles. March 12th.

3,954. Wireless Telegraphy or Telephony. Naamlooze Vennootschap de Nederlandsche Thermo-Telephoon Maatschappij. March 12th. (February 5th, 1915.)

4,600. Electric Heating Element for Kindling. R. K. Hearn. March 24th.

5,116. Gumming Machine for Gumming Telegraph Slip and the like. G. A. E. Purvis. April 3rd.

5,928. Ignition Magneto Driving Couplings. J. W. Montague. April 20th.

7,638. Control of Electric Motors. C. F. Brindley. May 21st.

8,421. Electric Incandescent Lamps. British Thomson-Houston Co. (General Electric Co., U.S.A.). June 7th.

8,696. Sparking Plugs. H. G. Longford, W. Longford & W. A. Clark (trading as Sphinx Manufacturing Co.). June 12th. (Addition to 7,365/13.)

8,860. Electrical Resistances. A. H. Railing, C. C. Garrard & P. Greenhalgh. June 16th.

9,346. X-ray Devices. British Thomson-Houston Co. (General Electric Co., U.S.A.). June 25th.

10,350. Electric Light Fittings. S. Fildes. July 16th.

10,370. Centrifugal Compressors. British Thomson-Houston Co. (General Electric Co., U.S.A.). July 16th.

10,421. Insulators. J. Roothaan & Ferranti, Ltd. July 17th.

11,457. Electric Distributing Systems. M. Hochstadter. August 9th.

11,511. Leclanche Cells and Methods of and Means for Resuscitating the same when apparently exhausted. J. T. Fahy & A. E. Otway. August 9th.

14,746. Electric Heating Apparatus. Automatic Telephone Manufacturing Co. & C. H. Archer. October 19th.

17,116. Electrical Table Lamp. J. Heiberg. December 6th. (January 9th, 1915.)

17,413. Electrical Apparatus for Heating Liquids. W. H. Smith. December 13th.